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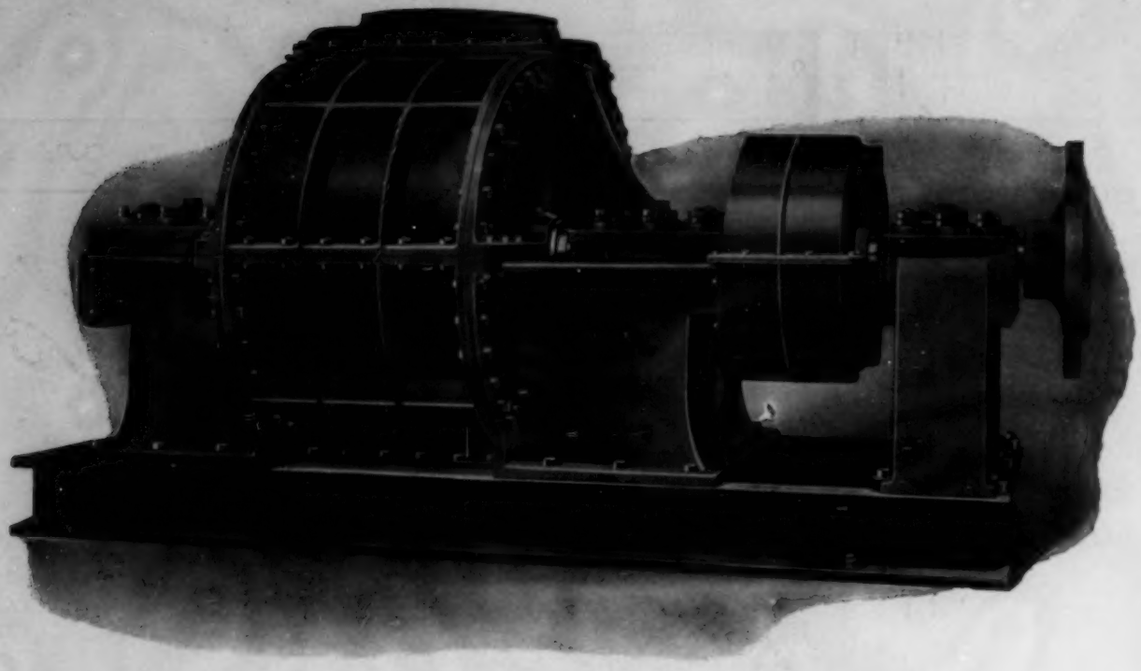

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THE IRON TRADE REVIEW

Vol. LX Cleveland, February 8, 1917 *No. 6*

Stirring Events Arouse Interest

International Complications Cause the United States Government to Urge Prompt Shipment of Materials, especially for Naval Uses

THE international situation and railroad congestion are factors of large importance in the iron and steel market at the present time. The breaking of diplomatic relations with Germany has caused increased pressure for delivery of some products, especially structural shapes and plates, and the railroad situation continues highly unsatisfactory and in some sections seems to be worse than ever. Fully 500,000 tons of steel are on railroad cars or piled along the right of way at Atlantic coast ports awaiting ships bound for Europe, over 300,000 tons being for the French government. This immense tonnage is likely to be increased during the next few weeks on account of the confusion in shipping and the decrease in the number of vessels sailing owing to the German submarine declaration. The policy of the allied governments seems to be to have the steel shipped from the mills to tidewater as fast as possible even if it becomes necessary to hold the tonnage for a considerable time. The demand for steel products for export has not been reduced on account of the new international complications. Some new inquiries, notably for rails, have been sent out by representatives of foreign governments. Sales are limited by the inability of the mills to take on additional business for the deliveries desired and by the lack of vessel room. A sale of 800,000 feet of seamless tubing has been made to Russia.

In the Pittsburgh district, emergency calls are being received from the government for various kinds of material for prompt delivery and indications are that heavy tonnages of pig iron, plates, shapes, chain, rivets, wire, sheets and tin plate will be needed soon. With iron and steel plants already overwhelmed with business, it seems certain that the entrance into the market of the government as a buyer of large quantities of materials will insure continued activity of plants, even if the submarine policy of Germany should result in the sharp curtailment of shipments to foreign countries.

Pig Iron

Manufacturers of munitions having contracts for the government have appeared in the market for additional tonnages of low-phosphorus pig iron and it is their evident intention to prepare for a large output during the present year. The Bethlehem Steel Co. is in the market for about 8,000 tons and other important eastern consumers have sent out inquiries. Since the danger of war became more serious, the demand for shipments has become more insistent, but furnaces are falling behind owing to the car shortage, which makes it difficult to obtain raw materials and to deliver pig iron. The Central Steel Co., Massillon, is in the market for 10,000 tons of basic for second quarter and another Ohio company is expected to enter the market for a round tonnage for last half. Unusual tonnages of Virginia and Alabama irons are coming to the lake district at the present time, owing to the shortage of northern iron.

Shapes and Plates

Companies engaged in turning out work for the navy are urging plate mills to hurry deliveries, especially of marine boiler plates. The same is true of structural material, of which large tonnages will be required by the government. An inquiry for 50,000 tons of tank plate recently sent out by English oil interest proves to be for work in the Mexican fields. An inquiry from Italy is for 40,000 tons of plates and 7,300 tons for four more boats have just been closed with domestic builders. Domestic ship yards are still resisting the paying of 6c, Pittsburgh, asked by eastern mills on ship plates.

Pig Iron Production

One result of the car shortage is shown in the pig iron production for January, which was the lowest of any month since February, 1916, while the average daily output was the smallest of any month since November, 1915. The January production amounted to 3,159,839 tons, a loss of 24,339 tons, compared with December.

THE OPEN HEARTH

Steel the Nation's Bulwark

STEEL, the master metal of peace, has been demonstrating, for more than two years past, its unquestioned position as the chief instrumentality of modern war. It is a tragic paradox that without this commonest metal of civilization, the superlative frightfulness of war as it is carried on today would not be possible. Every major agency of destruction of battle on land and sea requires steel in all or some of its essential parts. That with the nation strongest in steel resources has rested the advantage in armed conflict has been established by the position of Germany in the present war. That country, with her own steel industry, the largest in Europe, supplemented by the works in the Belgian, French and Polish territory conquered by her, for many months has held the tremendous strategic lead over her antagonists. Only recently has this margin of advantage been reduced or offset completely by the large draughts made by the entente powers upon the steel capacity of this country.

Now, with the clouds of war hanging so low that they may envelop this country at any time, despite the most valiant efforts to dispel them, the American steel industry stands forth as the nation's chief bulwark of material strength. Whatever may be the true state of preparedness of our organized fighting forces, this nation is blessed with strength in the greatest basic material of either peace or war which far exceeds that of any other nation. Today the ingot capacity of this country is more than double that of Germany proper and far in excess of anything the latter nation may command at home or in conquered nations. Should the supreme test come, shall we be able to so marshall and direct our industrial resources to realize the most formidable strength that lies in our tremendously-developed steel industry?

In the event of war being declared, a greater responsibility will rest upon manufacturers of steel than upon any other class of business men in the country, and that the call of patriotism will be promptly met, we do not for an instant doubt. No matter how radically steel manufacturers may differ with the President in politics, they will stand by him with perfect loyaley and enthusiasm. Already many steel and other manufacturing plants of the country have been offered to the government for any purpose desired, the price to be paid for products to be determined by the government itself. This is one of the first manifestations of genuine patriotism and many others will follow.

An Insult to Minnesota Legislators

THE perennial proposition of an iron ore tonnage tax is again bobbing up in the Lake Superior region and the latest proposition pending in Minnesota is to levy a special tax of 8 cents a ton on all iron ore mined within the state for mines producing more than 10,000 tons annually. There is nothing particularly novel about this, although the rate is somewhat lower than formerly proposed. An unusual feature of the present agitation is, however, a new argument that is being made in favor of the passage of the bill.

The *Telegram*, of Superior, Wis., states that at the time the tonnage tax bill was vetoed by Governor Johnson, a number of years ago, on account of the urgent opposition of the northern part of the state, the new plant of the Minnesota Steel Co. was in course of construction and the great enterprise was expected to furnish steel at prices lower than the Pittsburgh quotations, with the freight charges added from Pittsburgh to the head of the lakes. "With cheaper steel and a wonderfully large tributary country," says the *Telegram*, "it was reasonably believed that many subsidiary factories using steel in their products would be established. The big steel plant is on the Minnesota side of the state line and naturally Minnesota expected a considerable advantage as a result of having cheaper steel, not only by reason of subsidiary development in Duluth, but also in other Minnesota cities. This afforded strong argument against special taxation in addition to the regular taxation upon the iron and steel interests. Had it not been for this, the proposition to have a tonnage tax would have been an easy winner."

The *Telegram* then goes on to say that the steel interests have not supported the reasonable and just expectations which then prevailed, but that it is understood that prices in Superior and Duluth are the Pittsburgh prices with the freight charges from Pittsburgh to the twin ports added. The *Telegram* adds that the policy of the Steel Corporation amounts to a boycott of the industries of the state of Minnesota and intimates that for this reason the chances of the tonnage tax bill passing have been improved.

This editorial is an insult to the intelligence of the members of the legislature of the state of Minnesota. If they are willing to consider anything except the merits of the tonnage tax bill, they are not worthy to sit as members of the legislature. If the tonnage tax bill is wise and just, pass it; if not, reject it.

Even if there were any proper relation between the price policy of the Steel Corporation and pending legislation, the editorial would be unfair because it grossly exaggerates the facts. The *Telegram* admits

THE OPEN HEARTH

that the price schedules are not at hand, but says it is understood that they are the Pittsburgh price, plus the freight. It might well have added that whatever price schedules prevail at the present time are not such as are at all likely to prevail in normal times. The time-honored custom of charging the Pittsburgh price plus the freight to destination is always pretty well adhered to in times of prosperity, and today, in many cases, the prices are based on Pittsburgh as a matter of convenience, but frequently much more than the freight is added when sales are made at distant points. It is notorious that in times when the demand is not brisk, Chicago and other distant points pay very little in addition to the Pittsburgh price. So, regardless of what citizens of Minnesota may think about the tonnage tax bill, there is no reason for their becoming excited or improperly influenced at the present time.

Elements of Patriotism

The Name American Must Always Exalt the Pride of Patriotism.—Washington.

FROM the patriotism of the men who were at Washington in George Washington's time, to that of some of the men at the capital today, is a very far cry. It is a cry that begins at Lexington with a shout and ends in the present office of an ex-country editor in Seventeenth street, south of Pennsylvania avenue.

A cult that goes so far even as to sneer at patriotism as an outworn emotion has grown up in America. It is clever and fashionable to pronounce oneself a "citizen of the world".

But as between the attitudinarian and the excited citizen who becomes excited whenever a flag is waved, there is a large, and, for the most part, silent, body of Americans.

How is it with them? Do they, in the mass, still thrill with intelligent and thoughtful patriotism when the great names of American history—names so long debased by peanut politicians of various parties—are called to mind?

This is an age of unusual revivals—of one kind and another. Why not have a revival of real Americanism?

For an elementary course, turn to Webster, who says that an American is "A citizen of the United States". Even later editions do not demand that he be pre-eminently a citizen of humanity. And there may be found in the land some who will agree that Americans are citizens of humanity best when they are first of all and at all times citizens of the United States.

Webster declares that Americanism means "Attachment to the United States". (Washington and Raleigh, N. C., papers, please copy.)

We have the pacifist. He should and must be opposed with the Americanist, who, Webster says, is "One who studies, or is versed in, subjects related to America, as its history, etc."

Many nominal citizens of the United States are in sore need of a personally conducted review of what they *know* and *think* and *feel* about America!

Mr. Farrell's Wise Position

(*New York Journal of Commerce, Jan. 27.*)

IN HIS opening address before the fourth national foreign trade convention at Pittsburgh, the president of the Steel Corporation shows a clear perception of how this republic may best help to lay the foundations of a lasting peace for a distracted Europe. Mr. Farrell undoubtedly expresses the sentiment of a majority of his fellow citizens in regarding it as a debatable question whether the United States could become a member of an International League of Peace for the suppression of future war. He is equally sound in his declaration that our people can render an invaluable service to the establishment of lasting concord among the nations of the earth by setting their face against anything that looks to the perpetuation of commercial warfare in time of peace. The foreign trade convention can render no greater service to the world than by showing itself to be in full accord with the declaration that we shall greatly lessen the possibility of perpetuating in the domain of commerce the bitterness and hatred engendered by the war, if we refuse to be drawn into any convention, agreement or understanding that would make us parties to a boycott of the commerce of any of the nations now arrayed against each other. There is a large-mindedness about Mr. Farrell's treatment of the whole subject of the industrial and commercial conditions to be faced after the war, which deserves more than a passing tribute of praise. * * *

The course of the United States should be perfectly clear. It can have neither art nor part in any group system of commercial treaties designed to make it unprofitable for half the world to do business with the other half. On this point Mr. Farrell's verdict is all the more praiseworthy because he has been the first of our captains of industry to formulate it. He recognizes, of course, that no standing aloof from the new commercial combinations of Europe can interfere with the taking of such steps as may be found desirable to meet attempted discrimination against the exports of the United States, or the adoption of measures to break through any restraints that European powers may try to impose on its trade. But, given a resolute adhesion on our part to the policy of commercial magnanimity which Mr. Farrell outlines, and there will be little to fear under either of these heads.

Prices Present and Past

(Yesterday, a month ago, three months ago and a year ago.)

Quotations on leading products February 7, average for January, 1917, average for November, 1916, and average for February, 1916. Prices are those ruling in the largest percentage of sales at the dates named.

	Prices Feb. 7, 1917.	Aver. for Jan., 1917.	Aver. for Nov., 1916.	Aver. for Feb., 1916.
Bessemer pig iron, Pittsburgh...	$35.95	$35.95	$30.35	$21.45
Basic pig iron, Pittsburgh.....	30.95	30.95	25.95	18.77
No. 2 Fdy. pig iron, Pittsburgh	33.95	31.95	26.75	19.51
Northern No. 2 Fdy., Chicago..	31.00	30.00	25.00	18.50
Lake Superior Charcoal, Chicago	33.75	33.75	21.95	19.50
Malleable, Chicago	31.00	30.00	25.00	19.00
Southern No. 2, Birmingham...	23.00	23.00	19.60	14.63
Southern Ohio No. 2, Ironton...	30.00	30.00	24.00	18.00
Basic, eastern Pa.....	30.50	30.50	25.50	19.50
No. 2X Virginia furnace.....	27.50	26.50	23.75	18.00
No. 2X foundry, Philadelphia...	31.50	30.50	25.25	20.00
Ferro mang., delivered.....	250.00	175.00	155.00	140.00
Bessemer billets, Pbgh.....	65.00	60.00	52.00	34.00
Bess. sheet bars, Pbgh.....	65.00	60.00	52.00	34.00
Op.-h'th sh. bars, Pbgh.....	65.00	60.00	52.00	35.00
Open-hearth billets, Pbgh.....	65.00	60.00	52.00	35.00
Steel bars, Pittsburgh contract..	3.00	2.975	2.78	2.01
Steel bars, Chgo.....	3.19	3.19	2.89	2.23
Iron bars, Philadelphia.....	3.159	3.159	2.659	2.259
Iron bars, Cleveland, local del'y.	3.00	3.00	2.70	2.29

	Prices Feb. 7, 1917.	Aver. for Jan., 1917.	Aver. for Nov., 1916.	Aver. for Feb., 1916.
Iron bars, Chgo. mill.....	$3.00	$3.00	$2.52	$1.91
Beams, Chgo. contr.....	3.44	3.29	3.03	2.22
Beams, Pittsburgh, contr.....	3.25	3.075	2.88	2.03
Beams, Philadelphia	3.409	3.509	3.109	2.209
Tank plates, Pbgh., contr.....	3.75	3.575	3.35	2.13
Tank plates, Chicago, contract..	3.94	3.98	3.46	2.33
Tank plates, Philadelphia.....	4.909	4.909	4.159	2.659
Sheets, blk., No. 28, Pbgh.....	4.50	4.56	3.67	2.60
Sheets, blue anl., No. 10, Pbgh.	4.35	4.125	3.30	2.61
Sheets, galv., No. 28, Pbgh....	6.50	6.56	5.07	4.75
Wire nails, Pittsburgh.....	3.00	3.00	2.85	2.22
Connellsville fur. coke, contr...	8.00	7.25	3.75	2.50
Connellsville fdy. coke, contr...	6.50	6.375	8.60	3.75
Heavy melting steel, Pbgh.....	22.00	23.25	20.55	17.37
Heavy melting steel, eastern Pa.	20.00	21.50	19.50	16.50
Heavy melting steel, Chgo.....	21.25	20.25	19.35	15.25
No. 1 wrought eastern Pa.....	26.50	26.50	24.00	22.50
No. 1 wrought, Chgo.....	24.50	23.75	21.25	14.95
Rerolling rails, Chgo.....	25.50	27.25	24.90	17.12
Car wheels, Chgo.....	18.25	19.75	15.95	14.06

(For Additional Prices See Page 396.)

Munition Makers Buying Pig Iron

Evidently Preparing for Additional Contracts For the Government—Heavy Demand for Low Phosphorus—War Prospects a Factor in the Situation

Philadelphia, Feb. 5.—Manufacturers of ammunition and ordnance who now are filling contracts for the government and are liberal consumers of standard low phosphorus iron in their operations suddenly have entered the market for additional tonnages of this grade for shipment throughout the present year. It is believed these works either have been notified to prepare for additional contracts from the government or are anticipating such action and are gathering in the necessary raw material. The Bethlehem Steel Co., one of these plants, is asking for 8,000 to 8,500 tons additional for equal monthly deliveries this year. Other important eastern users are numbered in the list. Eastern makers of low phosphorus have sold their output closely up to the end of 1917 and will be put to considerable difficulty to meet these demands for additional tonnage. It probably will be necessary to divert some tonnage previously sold to munition plants in Canada and to domestic buyers for ordinary commercial purposes, in order that the government's needs may be supplied. Small sales of standard low phosphorus have been made for both domestic and foreign use at $57.50, Philadelphia basis, a new high price. Some makers are anticipating considerably higher prices.

War prospects have had no unfavorable effects upon the iron market. The heavy demand for shipments from consumers and the difficulties of distribution continue unabated. Some makers continue to fall behind their obligations. Such a condition led this week to the buying of a lot of 8,000 tons of prompt basic in behalf of a Pottsville, Pa., plant, the regular supply of which had been shortened recently by the blowing out of one of its furnaces. Of this iron, 5,000 tons were furnished by an eastern Pennsylvania maker at $30.50, delivered, or slightly under $30, furnace, and 3,000 tons by a Virginia producer at $31.75, delivered, or $29, furnace. On an inquiry for this iron in the valleys, $31 to $33, furnace, was asked by the makers. There is a limited amount of foundry iron inquiry, much of which is in small amounts for spot delivery. Eastern and central Pennsylvania prices remain at $30 to $32, furnace, for No. 2X. In Virginia, a 500-ton lot of high silicon for first half was sold at $30, furnace, and on an inquiry for 1,000 tons for last half, $28 for No. 2X was named by a large maker. Other makers will sell down to $27, furnace, for last half. Alabama iron is stronger due to the absorption of speculative offerings. A price of $24 for No. 2 seems minimum among the furnaces generally.

Feeling of Confidence

Birmingham, Ala., Feb. 6.—Pig iron manufacturers in the south express confidence in the face of the war flurry and apprehend no disastrous effect on the market which up to this time shows much strength. Some few sales of iron, immediate delivery, have been made recently, maximum quotations being obtained, $24 per ton, No. 2 foundry and basic. A number of inquiries have been received in this district again, delivery during the latter part of the year being stipulated. The prices for last half are around $23 per ton, No. 2 foundry, but no special efforts have been made to book business. Among inquiries to hand in the last few days are two or three asking if export business

(*For complete prices see page 396*)

could be switched to the domestic market. Further indications are given that there is need for pig iron for delivery within the next few months, small lot sales still being noted with immediate delivery being asked for.

Production of pig iron in the southern territory is being kept steady. With more railroad cars available for handling iron, there are further reductions in the accumulated stocks, in fact, one of the manufacturing companies in Birmingham announces that since Jan. 1 there have been not less than 10,000 tons of iron moved off yards in addition to the regular make during that time. As to raw materials, there is a fairly good supply save as to coke and this narrowness is accounted for in the fact that numerous sales have been made on the open market with the attractive prices being offered.

Melters Short on Coke

Buffalo, Feb. 6.—Severe weather conditions accentuating the railroad car shortage situation and the scarcity of labor combined are making it difficult for foundries of the Buffalo as well as other districts to obtain sufficient coke to keep their foundries in operation. Some consumers of pig iron have been forced to suspend temporarily owing to the inability to get coke. Carload lots are here and there being squeezed through the railroad embargoes from the coke fields and foundrymen, lucky enough to get a car are in a number of cases apparently pooling their scant receipts by dividing it up among several or more melters.

In the Buffalo district, there is little of the local production remaining unsold for delivery this year. Prices in advance of the nominal flat rate of $35 per ton at the furnaces are unable to induce the producers here to book offered tonnages. Southern and Virginia districts are furnishing practically the only iron obtainable here at this time.

Buying Southern Iron

Cleveland, Feb. 6.—The pig iron market in the Cleveland district has been featured recently by the buying of unusual tonnages of Virginia and Alabama irons. The sales have not been large, but are numerous. On Virginia iron, the usual quotation is $28, furnace, or $31.20, delivered Cleveland, for prompt delivery and 25 cents less for last half. Some sales of Alabama iron for prompt delivery have been made at $25, furnace, or $29, delivered, for No. 2 foundry, although it is reported that one company is selling at considerably less. In northern iron, the market is very quiet. One large firm is temporarily out of the market. An inquiry from France is for 10,000 tons of basic, bessemer and foundry grades.

The railroad situation as to furnaces and foundries is declared to be worse than ever. The furnaces are having great difficulty in getting supplies and delivering iron to foundries.

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Few Inquiries

St. Louis, Feb. 5.—Inquiries for pig iron are small and scarce, but the war situation has had the effect of changing market conditions, and prices are showing a tendency to mount upward. Ferro-manganese has jumped to $300 a ton, and a few sales have been made at that figure. Southern No. 2 is firm at $25, Birmingham basis, and northern is held at $30, Chicago, and $30 to $32, Ironton. Sales last week in this district were limited to car lots.

Chicago Market Dull

Chicago, Feb. 6.—Southern iron appears to be somewhat more active in this market than northern, though neither is showing much life. The malleable inquiry and sales of a short time ago did not last and the buying movement expected by some observers failed to materialize. Some demand is being made for small tonnages for prompt shipment, but second half iron lags. Expectation of labor trouble that may reduce first half melt is one factor delaying buying. Northern foundry and malleable remain firm at $31, furnace.

A brisk demand is being met for southern iron for spot delivery and brokers with iron bought last fall and being delivered now place the shipments as fast as they arrive. Southern foundry is quoted at $23.50 to $25, Birmingham, for first half and $23, Birmingham, for last half. Recent sales of 2,500 tons and 500 tons to stovemakers in this territory are of interest.

Ferro-silicon is being quoted now at $250 for first half, $200 for third quarter and $185 for last quarter, with freight allowed to middle western consuming points. This material is difficult to obtain.

Tennessee silveries are the only high silicons obtainable now and are quoted at $23.75, delivered, Chicago.

Prices Stronger at Pittsburgh

Pittsburgh, Feb. 6.—The severence of diplomatic relations with Germany has tended to strengthen the market for pig iron, according to veteran dealers. Domestic activity, it is believed, will be augmented by demand for iron for the manufacture of munitions in this country, and indications are that exports soon will be on an even larger scale. The Italian government, which recently took about 75,000 tons of bessemer iron, continues to be a prominent factor in the market, apparently having a standing inquiry for 100,000 tons of this grade. The Central Steel Co., Massillon, O., is in the market for 10,000 tons of basic iron for second quarter delivery.

Bessemer and basic irons are being held at $35 and $30, respectively. Average prices of bessemer and basic pig iron in January, according to compilations by W. P. Snyder & Co., based upon actual sales of 1,000 tons or more, were $35 and $30, valley, respectively. Compared with the average price for December, bessemer pig iron last month advanced $0.787, while basic iron showed no change in position. Compared with average prices for the year of 1916, the average price of bessemer pig iron in January advanced $12.0683, and basic pig iron advanced $9.9671.

Several dealers now are asking $35, valley, for both foundry and malleable grades for future shipment; some concerns are quoting these irons at $56 for nearby delivery. Fairly heavy demand exists for spot iron. The cold weather has adversely affected blast furnace operations in the central west. Numerous stacks have been banked for want of coke or limestone, deliveries of which are badly deferred.

Birmingham, Eng., Market

Birmingham, Eng., Jan. 19. — New Year's buying of pig iron commenced rather late, but seems now to be in full swing. Nearly all customers would gladly take larger quantities than smelters are prepared to supply. The idea of smelters is that the year will see a

(*For complete prices see page* 396)

serious shortage, but this view does not appear to be shared by well-informed authorities, who point to the increased permission to export, as evidence of easier conditions. In the Cleveland district, makers are not disposed to sell beyond the end of February. The committee locating supplies has increased the amount allotted to makers, which has had an immediate effect in checking stocks. Heavy inquiries are in the market, on account of the allies and of neutrals, but export licenses are sparingly granted, in view of the heavy demands from controled consumers. In the Midland district, prices have hardened, so that all sales may be taken as being at maximum figures, although a few people claim to be able to buy Northampton forge iron at slightly below the full rate. If this statement is correct, this is the only case of the kind, covering the whole range of pig iron. For the highest class of foundry iron there is great pressure in the market, war requirements for mill and machinery plant as well as for shipbuilding being exceptionally large. Some smelters are still dissatisfied that no application has been made to the ministry of munitions for an upward revision of prices. They urge that production is likely to be decreased, while labor is certain to be more costly, in view of the demand of the military authorities for more men. It is pointed out also that government inspectors are clamoring for heavier supplies of iron and steel. At present, the consensus of opinion on the subject is not sufficiently unanimous to ensure the desired application. But if coke, iron ore, and coal become dearer, as some authorities expect, smelters may be compelled to ask for higher selling rates. In the meantime, the smelters adopt a very cautious policy in the bookings of orders, and generally content themselves with merely repeating completed contracts. In the West of Scotland, a large output is maintained of best irons for war requirements. With regard to East Coast hematite, prices are unchanged, and the full output of the furnaces is readily absorbed for war requirements. Some increase of production has been effected, but this has been altogether outpaced by the growing demand.

Uncertain at Cincinnati

Cincinnati, Feb. 6.—The pig iron market is gradually reaching an uncertain state. Prices on southern and southern Ohio iron are questionable, and the market has no way to determine just what figures certain stacks would make on desirable business. Sales have been mostly of a secret nature recently, and general inquiry has been so unimportant that buyers and sellers have found it difficult to secure much information concerning prices. It would not be surprising if the market moved either way in the next few days. The general tendency points to an advance in quotations rather than a decline, but several furnaces are known to be anxious for business, and may make concessions at any time. Two large inquiries before the market are not attracting much attention. One is from the French government, and calls for 10,000 tons of either basic, bessemer, northern or southern foundry iron, for shipment as quickly as possible. The other is for 10,000 tons from the government of Chili, but neither make nor delivery is specified. An Indiana melter has closed for 1,000 tons divided between northern and southern foundry iron, for last half delivery. Southern No. 2 foundry is quoted from $23 to $25, Birmingham basis, for 1917 delivery, and southern Ohio No. 2 foundry at $30, Ironton basis, for the last half of the year.

Effect of War Cloud

New York, Feb. 6.—War clouds and the German submarines crisis, beyond deducing the flow of export shipments from eastern ports by their having seriously disturbed the already heavily-taxed over-sea shipping, are producing no adverse effects on the iron market. Fewer boats now are moving and it is practically impossible to get quotations on any space to the danger zone, where previous rates largely had been prohibitive. In the present confused state of things, the outlook for the foreign movement of iron, at least, for the near future, is a mater of pure speculation and must depend upon the measures which Germany's opponents are able to use to keep the sea paths free. There is a feeling in some quarters that resale offerings of iron, originally sold for export but held back by lack of vessel room, may be swollen considerably. The offerings of this character have been increasing in recent weeks as the shortages of ships has become more acute. These have included 2,000 to 3,000 tons of Alabama foundry iron at southern ports, and some bessemer. Very few new export sales of iron have been made since the new German submarine edict was issued. The bessemer negotiations for the French government are continuing. The new inquiry has continued brisk and has included 10,000 tons of besemer for Italy; 5,000 tons of bessemer and 5,000 tons of foundry for Switzerland; 3,000 tons of foundry for Holland and 1,000 tons of foundry for Sweden. A few domestic buyers who were in the market either have withdrawn their inquiries or are holding off from closing. A Fitchburg, Mass., consumer remains in the market for 2,500 tons of foundry iron. The government opened bids today on 2,100 tons of foundry, charcoal and low phosphorus iron for various navy yards. Prices show no change. The Virginia Iron, Coal & Coke Co. today withdrew all prices except on special analyses.

(For complete prices see page 396)

Cast Pipe Slow

As Cities are Hesitating on Account of High Prices

Chicago, Feb. 6.—High cost of cast iron pipe is holding back much waterworks extension and cities are slow to come out with their inquiries. Bids are being considered at Springfield, Ill., on 1,250 tons of 24 to 36-inch pipe and 500 tons of smaller sizes. Columbus, O., will open bids Feb. 12 on its requirements to mid-year, with an option for the entire season. The United States Cast Iron Pipe & Foundry Co. has been awarded 300 tons of specials by the city of Chicago and 1,100 tons of pipe by the city of Cincinnati.

An Eight-Mile Line

New York, Feb. 6.—Rochester, N. Y., is planning to take bids in March both for iron and steel pipe for the construction of an 8-mile water line. If cast iron pipe is used, about 10,000 tons of 37-inch will be required. A steel design would call for a considerably smaller tonnage of ¼-inch pipe. Buffalo, N. Y., will take bids Feb. 15 on 1,600 tons of 3 to 16's. On the same sizes for Cincinnati, the Hammong-Byrd Iron Co. was the low bidder, but its tender was irregular. The next lowest bidder was the United States Cast Iron Pipe & Foundry Co. New business in cast iron pipe in the east continues light. Open prices are steady, but it is probable that attractive lots would bring some concessions. Export inquiries are coming out from time to time, but few of these are being converted into orders. There is some doubt whether a current inquiry for 9 miles of 12-inch is for Sweden or for India, both of which have been stated.

Cold Rolled Strip Steel

Pittsburgh, Feb. 6.—Cold rolled strip steel is being held at 7c, base, for shipment at the convenience of the manufacturer. Specifications are heavy and some new demand exists. Consumers are attempting to buy material for delivery after July 1, next.

Arthur Davidson, general sales manager, Harley-Davidson Motor Co., Milwaukee, and Mrs. Davidson, left last week on a six months' tour embracing the Hawaiian islands, Philippines and Australia.

Billet Price High

General Quotation on Semi-Finished, Second Quarter, $65

Pittsburgh, Feb. 6.—Consumers of billets and sheet bars in the central west likely will pay $65, mill, for their requirements in the second quarter of this year, unless they covered needs some time ago. So far as can be ascertained, none of the mills in this district is willing to offer material at less than $65, mill, and some tonnage is being held at $70, mill, for delivery in April, May and June. Demand for both products is heavy; not much tonnage is available for early shipment. The shortage of gas is affecting production to a considerable extent, many open-hearth furnaces being idle, because of the insufficient supply of natural gas. The Carnegie Steel Co. is equipping a battery of 24 furnaces at Homestead and eight furnaces at Clairton for the use of powdered coal as fuel. Oil is being consumed at many plants in this district. Wire rods are being quoted at $75 to $80, although no tonnage has been sold recently in the open market. Muck bar is held at $50, Pittsburgh.

Rerolling Material Light

Philadelphia, Feb. 5.—Two inquiries of 10,000 tons each of rerolling billets for export were placed before an eastern maker this week by New York buyers, but this producer was unable to entertain the business. This maker is sold up tight on rerolling material. It is thought these inquiries originated in the same source. No new inquiries for shell steel are out, but from the Pittsburgh district comes the report of some new orders of this kind being closed there. An eastern maker has sold forging billets at $85, mill, and wants at least $65, mill, for rerolling open-hearth steel, but has little for sale during the current year.

High Sheet Bar Price

Youngstown, O., Feb. 6.—One large sheet bar interest in the valley has opened its books for second quarter business at $65, the prevailing price. But it will do no spot business, at any figure, and will not guarantee deliveries for any time. Where there is great insistence, this semi-finisher is willing also to close at the figure named for second half business.

Sheet bar consumers are reported as being unwilling to close at the $65 figure, even in the face of possible higher figures, if war breaks out, but there is at present no indication anywhere in the Mahoning valley that it will be shaded, except for contract customers.

Shipping conditions are such that the semi-finishing mills are working from day to day with shutdowns always in immediate prospect. Difficulty in getting coal is the principal trouble.

Car Builders

Are Active in Urging Standard Methods for Making Equipment

New York, Feb. 6.—Redoubled energy is to be put into the organized crusade by the car builders of the United States to bring about standardized manufacturing methods in American railroad cars according to plans which were evolved at a dinner of the Railway Car Manufacturers' Association held at the Metropolitan Club, New York City, Feb. 1, which was attended by the executive officers of every leading car works in the country. Dr. W. P. M. Goss, former dean of the college of engineering of the University of Illinois and past president of the American Society of Mechanical Engineers, was elected president of the association and will direct a vigorous campaign to bring about the desired aim of the organization. The other officers chosen were vice president, J. M. Hansen, president of the Standard Steel Car Co.; secretary and treasurer, Wm. Bierman, secretary Standard Steel Car Co.; executive committee, Mr. Hansen, F. H. Hoffstat, the Pressed Steel Car Co., W. H. Woodin, president the American Car & Foundry Co., and J. S. Ralston, president the Ralston Steel Car Co.

The movement is aimed toward influencing the railroads to adopt standardized designs and parts in the interest of more economical and efficient manufacturing operations, greater facility in repair and replacements, etc. At present, practically each railroad is developing its own design of the same general types of cars and uniformity is lacking.

The car market is quiet. Nothing further has developed from the large French inquiry and builders continue their efforts to influence the buyers to adopt American standards. The E. E. White Coal Co. has placed 100 mine cars with the Pressed Steel Car Co. and the Lackawanna 10 express and 10 passenger with the Pullman Co. The Interborough Rapid Transit Co. is inquiring for 300 subway bodies and trucks; the Duluth & Iron Range for 50 gondolas, 25 flats, 25 box and 10 refrigerators; the Detroit-Edison Co. for 10 gondolas and the Philadelphia & Reading for 40 coaches and 10 combinations.

Railroads continue to place locomotives heavily. The Seaboard Air Line has ordered 30 from the American Locomotive Co. and the recent New York Central order has been increased to 60 with the American Locomotive Co. and 90 with the Lima Locomotive Works. The Chicago & North-Western ordered 20 of the American Locomotive Co. The Illinois Central is in the market for 75 and the Lehigh Valley for 65 locomotives.

Rails Bought

Cleveland, Feb. 6.—The Nickel Plate railroad has purchased 5,000 tons of rails from the Lackawanna Steel Co., which has also sold 1,800 tons to the Cleveland & Youngstown. All of this tonnage is for 1918 delivery.

Tin Plate Books

For Last Half Not Yet Opened Owing to Uncertainties

Pittsburgh, Feb. 6.—Manufacturers of tin plate are closely watching the market for pig tin, the price of which likely will advance sharply, as a result of the break in relations with Germany. It is not likely that books for third and fourth quarter delivery will be opened until the future situation can be more clearly analyzed. Heavy demand exists for tin plate for shipment after July 1. Scattering sales are being made at 7.50c to 8.25c for nearby shipment. Long terne plates are commanding $7 to $7.50c, base.

Wire Prices Unchanged

Pittsburgh, Feb. 6. — Prices of wire products are unchanged. Material is being quoted on the basis of $3 a keg for nails, the price adopted Nov. 24, last. According to some people in close touch with the situation, an advance in quotations is imminent. Specifications are heavy, but new buying has fallen off slightly. Demand for shipment abroad is active.

Nuts, Bolts and Rivets

Pittsburgh, Feb. 6.—Heavy demand exists for nuts, bolts and rivets. Car and ship builders are specifying briskly, heavy tonnages are being shipped to foreign ports, and it is not unlikely that prices will be put up at an early date.

The American Drop Forge Association will hold its annual convention in Cleveland, June 14, 15 and 16, instead of June 7, 8 and 9, as originally announced.

(*For complete prices see page* 396)

Sharp Advance In Ferro

Spot Market Quickly Affected by International Conditions—Spiegeleisen Also Marked Up

New York, Feb. 6.—Expectation of increased difficulties in bringing in foreign manganese ore under shipping conditions, so disturbed with the attendant effect upon costs of production, has caused a sharp upturn in domestic ferro-manganese since the declaration of unrestrained submarine warfare by Germany. A secondary factor in the situation is the probability of further curtailment of imports from English makers against first-half contracts with American users which already had been running some weeks behind schedule. Domestic makers now are quoting $250, delivered, east of the Mississippi river for spot or first half; $200 for third quarter and $185, for last quarter. This is an advance of $50 in spot and from $10 to $25 in future prices, during the week. Before the new schedule became effective, Feb. 5, a lot of 200 tons for first half was closed in the east at $200, delivered, and two lots of 100 tons each in the Pittsburgh district at $185 and $190, delivered. There were other sales around these prices. Inquiry for early delivery has picked up sharply during the past few days and about 4,000 tons are pending, including one round lot for the middle west. An eastern maker reports inquiries for 1,500 tons. Two Ohio buyers are in the market, both for about 600 tons each.

Spiegeleisen also has advanced considerably. Eastern makers who are able to furnish early deliveries now are quoting $65, furnace, for 20 per cent, up to July. Small sales have been made at close to $70, furnace. An Ohio river consumer was able, however, to pick up a special lot of 400 to 600 tons at under $63, delivered, and larger lots for delivery after July are obtainable at lower prices than for the first half.

Fluorspar High

Philadelphia, Feb. 6.—Fluorspar for prompt shipment continues to command very high prices. A sale of a number of cars of gravel spar for delivery by April has been made to a steel works buyer in this district at $21.50, at the mines.

Alloy Prices Rise

Pittsburgh, Feb. 6.—Prices of ferro-alloys and steelmaking metals reflected strength immediately after the breaking of diplomatic relations with Germany. Ferro-manganese is being held at $250 a ton, with most dealers unwilling to sell at any figure. Spiegeleisen has been advanced $5 a ton to $70, furnace, and other alloys reflect strength. Fifty per cent ferro-silicon continues to be held at about $175, and lower grades of bessemer ferro-silicon are firmly maintained on the basis of $42, furnace, for 10 per cent. A local consumer last week closed for 300 tons of 11 per cent ferro-silicon at the current price. Ferro-alloys are declared to be scarce and it is not unlikely that prices will advance sharply all along the line.

Sheet Prices Firm

With Upward Tendency—Railroad Situation Desperate

Youngstown, O., Feb. 6.—More sheet business than can be handled continues to pour in upon the manufacturers, and the market is firm at about the same high level of prices quoted for weeks past, but production is threatened daily by shortage of fuel. Because of the railroad situation, which is described by traffic managers as "desperate", most of the plants, large and small, have only enough coal to last them from 24 to 36 hours. Inquiries for sheets from foreign sources show no signs of abatement.

Quotations on black sheets with plenty of sales are at 5c to 5.50c, with a slight shading of the minimum by one or two of the mills to regular customers. Blue annealed are held at 4.25c to 4.75c. Galvanized are played strongly at the wide range of 6.50c to 7.50c, with perhaps most of the business at slightly under 7c. These quotations are for bessemer sheets. Very little open hearth is for sale at any price; to such as may be bought, the normal 10c differential applies more or less according to specifications.

Spot business continues to prevail generally, except to contract customers. Specifications as to time of delivery are omitted by general consent. And with the high prices of sheet bars, and uncertainty of supplies, both by reason of difficulty in buying and trouble with shipments between semi-finishers and finishers, there is no prospect that prices will come down or that quotations will be made for much future business.

If war comes, valley sheetmakers say, prospects are for still higher prices. But they are also ready to turn over their production and their plants to the government when the government is ready to call for them. Information as to all the Mahoning valley plants, in common with manufacturing plants generally throughout the country, has been in the hands of the naval advisory board for six months and more.

In the valley these days all things begin and end with the railroad problem. Although the situation today merits description as desperate, according to all reports, hope is felt that conditions may improve.

Pressing for Shipments

Philadelphia, Feb. 5.—Not so much new selling of sheets is being done by eastern makers, but the latter are being pressed constantly by consumers for shipments. Early sheets are scarce. There is little evidence of any buying being held up by the current international complications. Prices remain firm at 4.50c, Pittsburgh, or 4.659c, Philadelphia, as the minimum of No. 10 gage blue annealed and with as high as 5c, Pittsburgh, quoted in instances.

Nothing to Sell

Cleveland, Feb. 6.—Sheet manufacturers representing mills of the Youngstown district have none of the product to sell at the present time. Owing to the sold up condition of the mills and the slow deliveries, the prospects for improved conditions are not favorable.

Sheet Products Advance

Pittsburgh, Feb. 6.—Prices of steel sheet products are hardening all along the line. Many consumers now are pounding mills for additional tonnages for shipment before July 1, after giving up efforts to buy material for delivery after that date. Domestic demand is augmented by heavy pressure for sheets for shipment to entente nations; these inquiries, however, are not being generally entertained, on account of inability to meet specifications for delivery.

Black sheets are selling at 4.50c to 5.60c for No. 28 gage, the maximum price being 10 cents above that previously prevailing. While all mills have not formally withdrawn the 4.35c price of blue annealed sheets, no material has been offered recently at less than 4.50c, base. The bulk of the blue annealed tonnage is being sold at 4.50c to 5c, base. Galvanized sheets are commanding 6.50c to 7c, prices above the latter figure having disappeared this week. About 40 per cent of the galvanizing capacity of sheet mills is in operation; a week ago, only 32 per cent of the galvanizing pots in sheet mills were in use. Scarcely any coated stock is available for nearby shipment.

As previously indicated in these columns, automobile, electrical equipment and farm machinery manufacturers are

(For complete prices see page 396)

negotiating for requirements for the third and fourth quarters of the year. On account of the uncertainty of the situation caused by international developments the last few days, it is not unlikely that manufacturers will not open books for second half delivery for 30 days or longer.

Coke Shipments

Are Seriously Curtailed on Account of Car Shortage

Pittsburgh, Feb. 6.—The cold weather this week seriously has interfered with the operation of coke ovens in the Connellsville regions, and the car situation is described as being more acute than ever. Many plants on Monday operated only at 20 per cent of normal capacity. Consumers are complaining about deferred deliveries, and several blast furnaces have been forced to bank for want of fuel. Spot furnace coke is being sold at $8.75 to $9.50, ovens; the market for contract fuel has not been established, except for shipment in the next 30 or 60 days. Consumers of foundry coke are manifesting interest in the market for delivery after July 1, but no large tonnages have been sold for extended shipment. Demand for spot 72-hour coke is fairly heavy, but prices are unchanged. *The Connellsville Courier* for the week ending Jan. 27 says production was 352,401 tons, compared with 347,490 tons the week before.

Wide Spread

Philadelphia, Feb. 6.—Spot Virginia foundry coke has been sold within a few days at a price of $12, ovens. Coke prices continue to show a considerable spread in this territory. Small sales of spot Connellsville furnace coke have been made this week at $9.25, ovens, and also at $8.75, ovens, while there are reports that $8.50, ovens, has been done.

Price Advanced

Cleveland, Feb. 6.—Reports from the Connellsville region indicate worse conditions in regard to cars and the minimum price of foundry coke is now $11.50, ovens, for prompt delivery in this district, an advance of 50 cents over last week. Many foundries are working from hand to mouth.

Scarcer at Cincinnati

Cincinnati, Feb. 5.—The present cold weather is causing coke prices to strengthen. Operators are receiving such heavy demand for coal at fancy prices that they can profit more by selling it direct rather than by turning it into coke. Production, which has not been sufficient to supply demand for some time, has been further curtailed during the past week. No quotations are available on furnace coke, and only a few producers are offering foundry grades for contract for 1917. The usual quotations on foundry grades range from $8 to $11, ovens, for New River, Pocahontas, and Wise county makes, for contract delivery. Coke for spot delivery is bringing abnormal prices, depending upon conditions surrounding each sale.

Delivery Hampered

St. Louis, Feb. 5.—A shortage of cars still hampers the delivery of coke, while the demand continues to be extremely good. Connellsville and Virginia 72-hour foundry grades are firm at $12, ovens. There is no by-product coke on the market here, and run-of-ovens is held at $11, ovens.

Steel Bar Buyers

Are Sounding the Market for Last Half Contracts

Philadelphia, Feb. 5.—Some buyers of steel bars in this territory have been sounding out makers on contracts for the last half of the year, but the latter, especially the independent mills, have declined to quote. There has been some selling for second quarter with more still to be done, by one maker at 3.25c, Pittsburgh. Usually only small lots are being dealt in. In some cases, 3.50c, Pittsburgh, or 3.659c, Philadelphia, has been paid. Certain independent mills have not yet finally decided what price they will quote for second quarter contracts, but it will not be below 3.25c, Pittsburgh. Bids will be taken Feb. 19 on a proposal for the Panama canal, 500 to 1,000 tons, which includes a considerable amount of bars.

Bar Price Firmly Held

Pittsburgh, Feb. 6.—Several mills in this district say specifications against contracts for steel bars have fallen off slightly this year, although deliveries show no improvement. This is largely because of the congested traffic conditions. Bar stock is being held at 3c for shipment at the convenience of the maker. None of the mills in this district have advanced prices recently.

New Bar Mill

The Youngstown Sheet & Tube Co., Youngstown, O., has completed its new merchant bar mill, and has rolled a small tonnage to test the machinery, but will not open it for continuous work for some time in the indefinite future.

The Republic Iron & Steel Co. has completed its new 16-inch lap weld tube mill at Youngstown, and has tested it, but is not ready to make any announcement as to when regular work will be begun.

Both companies face conditions generally throughout the country. They are kept busy supplying mills already in operation, with fuel and raw material, and are not as yet able to plan definitely on new production.

Bar Market Quiet

Chicago, Feb. 6.—Conditions in the steel bar market are quiet and unchanged, with the nominal quotation steady at 3.19c, Chicago mill, and most makers unable to book additional tonnage. Crop ends are being rolled by some small mills and for this product 3.25c and even more are being paid, as delivery is immediate.

Hard steel bars continue firm at 3c, Chicago, and indications are excellent for heavy demand in a few weeks, when reinforced concrete construction can be resumed in the north. Plans are being laid now for much construction in this line.

Bar Iron Sales Small

Chicago, Feb. 6.—Makers of bar iron are not taking on much more tonnage, as the remaining product of their mills for first half is small. Regular customers are coming in for small contracts from time to time and there is some demand on the part of railroads. Eastern consumers, unable to obtain sufficient material from mills there, are seeking bars in the west and for this a premium over local prices is being obtained, the quotation being 3.10c to 3.25c, Chicago, while for delivery in this territory 3c to 3.10c, Chicago, is the ruling quotation.

Hoops and Bands

Pittsburgh, Feb. 6.—Prices of hoops and bands are unchanged. The Carnegie Steel Co. continues to quote hoops at 3.50c and bands at 3c for delivery at its convenience. Mills in a position to meet specifications for shipment before July 1 are quoting both products at 4c and above in many instances.

Shafting Demand Heavy

Pittsburgh, Feb. 6.—Cold rolled steel shafting continues to be quoted at 15 to 20 per cent off the list, although the latter figure gradually is disappearing. Specifications are coming out in heavy volume and new demand is described as heavy.

Spencer C. Koeneke, production manager for the Electric Steel Co., Chicago, died Jan. 24, as the result of a fractured skull received when he was thrown from a taxicab which had collided with a telegraph pole.

(*For complete prices see page* 396)

Speeding Plate Deliveries

Is Urged by Plants Engaged in Naval Work—Heavy Inquiry For Plates of All Descriptions Continues

Philadelphia, Feb. 5.—Some of the plants which are completing naval work for the government have asked the mills during the past few days to speed up deliveries upon these, especially in marine boiler plates. The navy department also will take bids Feb. 8 on an ammunition ship requiring 3,000 to 3,500 tons of steel. There is talk of other government needs in the plate line which are to be pushed ahead as the result of the break with Germany, but these have not reached the market in definite form.

A heavy inquiry for plates of all descriptions continues to come out. Heavy specifications also are the rule with eastern mills and cancellations are rare. New demand seems to have been little affected by the week's stirring developments. A fresh ship yard inquiry for Italy calls for 40,000 tons of plates for the first half, but sellers have withheld prices pending more definite information. Orders for 7,300 tons for four more boats just closed with domestic builders have been placed with eastern mills, for 1918 delivery. One company ordered three steamers requiring 6,000 tons, and another a single vessel taking about 1,300 tons of plates. Domestic ship yards are opposing paying the 6c, Pittsburgh, price asked by eastern mills on ship plates. There are reports that some of the business recently closed has been considerably below that level, though these same makers have been able to get 6c, Pittsburgh, for export. Some makers are sticking to a 6c price for either domestic or export and of a sale of 600 tons of both plates and shapes made during the week the former product brought this figure. A sizeable order for Lloyds boiler steel, no marine test, was taken at 8c, mill. Small stock lots of hull plates were booked at 6.50c base, mill.

A 50,000-ton tank plate inquiry recently put out by prominent English oil interests proves to be for tankage work in the Mexican fields. These buyers have been quoted 3.50c by large middle western makers for delivery next year, but the order has not been closed since some shipments are wanted this year. The 17,000-ton inquiry from the Laconia Car Co., covering bids on Russian cars, has not been closed, but has become inactive. Large tonnages of plates are sought by car builders. Locomotive buying, which is active also, is absorbing much material. Ordinary tank plates continue to be quoted by eastern makers at 4.75c, Pittsburgh.

Demand Heavy

Pittsburgh, Feb. 6.—The production and shipment of finished commodities have been affected adversely by the cold wave that hit western Pennsylvania Sunday. Finishing plants have been operating only in part, and the car supply has been extremely low. Numerous engine failures are reported. Despite curtailed production, material is being piled in mill yards. Demand for steel plates is very heavy. Manufacturers likely will be called upon to furnish tremendous tonnages for the building of ships for the government, if the international situation becomes more serious. Although mills cannot promise deliveries until the latter part of this year, government officials will have no difficulty in obtaining deliveries in the event that material is needed. For shipment at their convenience, manufacturers are asking from 3.75c to 4.50c. Specifications against contracts have not fallen off and new demand is heavy.

Deliveries Delayed

Cleveland, Feb. 6.—Manufacturers of plates are having very serious trouble in making deliveries, owing to the slow movement of cars. Two cars loaded with plates on Dec. 5, for shipment to Canton, were missing until a few days ago. One was finally delivered at Canton last Saturday, after having been sent to the Chesapeake & Ohio as an empty and after losing time at various points. The other one has been located in Cleveland and it is hoped that delivery will be made in Canton in the near future. Plate prices are very firm and Cleveland mills continue to quote 5c, while eastern Pennsylvania companies are asking 5c for delivery in 6 to 8 months on sheared plates. A contract for 3,000 tons of plates is understood to have been placed by an Ohio locomotive company at 3.75c for delivery at the convenience of the mill, which in this case will probably be about 18 months.

Plate Demand Insistent

Chicago, Feb. 6.—Although steel plates in any considerable tonnage are not obtainable from important makers, demand for this material continues strong and ship builders have sought to place orders for delivery over three years, to the end of 1919. Such long contracts have not been taken, but this indicates the opinion of consumers as to the continuance of present conditions in this product. The nominal quotation on plates is 3.94c, Chicago, with premiums up to 5c offered for prompt or slightly deferred delivery.

(*For complete prices see page* 396)

Warehouse Prices

Are Advanced in Harmony with Recent Mill Changes

Chicago, Feb. 6.—Advances have been made by Chicago warehouses to bring quotations in line with recently announced mill prices. Shapes and plates from store are $3 higher and No. 10 blue annealed sheets have been advanced to 5c, Chicago store. The same proportionate advance has been made on the same material at St. Louis and St. Paul. Demand for steel from warehouse is strong and assortments are much broken in many instances.

Pittsburgh Advance $3

Pittsburgh, Feb. 6.—Warehouses at this center have put up prices of plates, shapes and bars, under 2 inches in diameter, $3 a ton to meet similar advances announced a short time ago by manufacturers of plates and shapes. Bars over 2 inches in diameter, show no change in position, being quoted at 4.40c. Plates are being held at 4.65c, shapes, 4c, and bars under 2 inches in diameter, at 2.90c. Demand for warehouse material is heavy. Stocks are low and warehouse managers cannot fill large orders for single sizes.

Higher at Cleveland

Cleveland, Feb. 6.—In keeping with the recent advances in mill prices, warehouse prices on steel bars, shapes and plates have been advanced $3 per ton, while No. 10 blue annealed sheets and hoops have been advanced $5. Quotations are now as follows: Squares and rounds, 2 inches and over, 4.50c; under 2 inches, 4c; iron bars, 3.95c; shapes, 4.10c; plates, 4.75c; No. 10 blue annealed sheets, 5c; hoops, 5c.

Warehouses Advance

Cincinnati, Feb. 5.—Warehouse prices for Cincinnati and vicinity have advanced all the way from $2 to $4 a ton. Steel bars are now quoted from 3.90c to 4.45c, and special bars at 4.10c. Shapes and plates are given from 4.10c to 4.75c, in comparison with 3.90c to 4.60c last week. No. 10 blue annealed sheets are held at 5c, black sheets No. 28 gage at 5.25c, and galvanized No. 28 gage at 7.50c. All of the above prices are f. o. b. Cincinnati basis. Dealers report business heavy.

Scrap Market

Is Awaiting Developments—Little Change the Past Week

Pittsburgh, Feb. 6.—Recent developments in the international situation, unlike Germany's proposal for peace, have failed to affect the market for iron and steel scrap. Dealers are watching the situation closely and it is not likely that prices will change until the general situation appears more certain. Several dealers predict that prices will register advances just as soon as active buying is renewed. Scarcely any tonnage is being carried in stock by dealers. Heavy melting steel is quoted at $22 to $23 and other grades show no change in price.

Buyers Hold Back

Philadelphia, Feb. 5.—All indications of betterment that were discernible in the scrap market in this territory a week ago have been dissipated by the war talk and buyers are holding back because of the present uncertainties. New business is at lower figures. A mill on seaboard bought several thousand tons of heavy melting steel at $20, delivered. For export, $21 to $21.50, Philadelphia, still is offered, but the railroads are letting through only a certain amount of shipments, and sellers are not desirous of these orders where deliveries are so indefinite. Cast scrap is down to $20, delivered. Low phosphorus in small lots has been sold at $30, delivered in this territory.

Unsatisfactory Conditions

Buffalo, Feb. 6.—Dealers of the Buffalo district seem to be of the impression that the possibilities of war will have a stimulating effect upon the scrap market. There has been no change in prices from the revised schedules that have held for the past two weeks. One reason is the limited amount of business transacted in the past week. The orders closed have been so few in number and so small in tonnage as to be insufficient to reflect any alterations of the schedules.

The principal concern of the consumers and the dealers alike is the railroad situation. Embargoes, car shortages, scarcity of labor and the severe weather are all contributing factors in making the situation most unsatisfactory.

Stronger Market Expected

Cleveland, Feb. 5.—Dealers in scrap iron and steel in the Cleveland district declare belief that most any eventuality in the international situation must result in a stronger market. Just now there is no buying heavy enough to determine the character of the market.

Heavy melting steel remains at $21.50 to $22, and other lines, with a few exceptions, are about as they have been for several weeks. No. 1 bushelings, quoted nominally at $18, now stand at $17.50 to $18; machine shop turnings, nominal at $9 to $9.25, are marked $8.75 to $9; cast borings, nominal at $9.25 to $9.50, are $9 to $9.25.

That the consumers must in any event soon come into the market for urgent requirements is asserted by the dealers to be inevitable.

Steady at Cincinnati

Cincinnati, Feb. 5.—The iron and steel scrap market is growing more uncertain each week. Users are still refusing to cover for first half or first quarter requirements, although it is known that a large number have only light tonnages contracted for, and are buying small lots to fill in from time to time. Melters are showing a strong tendency to withhold buying for more than a few days ahead until the war situation becomes clearer. The strength shown in pig iron, and optimism on the part of dealers are holding prices unchanged from those that have prevailed for the past three weeks. Heavy melting scrap is given from $19 to $20 a gross ton, Cincinnati, and No. 1 machine cast from $15.50 to $16 a net ton, Cincinnati.

Chicago Scrap Steady

Chicago, Feb. 6.—Iron and steel scrap in this market seem to be marking time, with consumers taking only what they need, using most from their reserves. In view of the present uncertainty, no one desires to add to his holdings, yet there is no tendency to create a short interest.

Some scarcity has developed in some grades, notably in railroad wrought, which has not been coming forth in as large supply as usual. A slight advance in this grade has been made recently. Most quotations remain steady at about the same level as has prevailed recently and no marked change is expected.

The Wabash railroad offers 2,000 tons of scrap, including 950 tons of rails, the Kansas City Southern offers 500 tons of scrap rail and 70 tons of miscellaneous scrap. George W. Jennings offers 1,500 tons, including 400 tons of wheels.

Very Little Activity

St. Louis, Feb. 5.—There have been very few transactions in scrap within the last week, and the continued absence of buying has somewhat demoralized the market. Consumers appear to have enough tonnage under contract for some weeks to come, and as far as can be seen, they will be out of the market for sometime. Transactions between brokers are at slightly lower levels, but due to continued light railroad offerings, prices remain relatively firm. The only offering before the market this week is an open list issued by the Boston & Maine.

Weaker in New York

New York, Feb. 6.—A weaker tendency continues in the old materials market, which the week's uncertainties have intensified. There is small disposition on the part of consumers to buy. Export selling is held up pending developments.

Lower prices are shown in a number of grades, including heavy melting steel, wrought pipe, borings and turnings and stove plate. Small lots of steel are going as low as $17.50 to $18, New York.

(*For complete prices see page* 396)

Butt Weld Pipe

Has Been Advanced $4 Per Ton by One Manufacturer

Pittsburgh, Feb. 6.—The Wheeling Steel & Iron Co. on Feb. 2 put up its prices of butt welded steel pipe two points, or $4 a ton. None of the other manufacturers has formally changed quotations, continuing to offer material at prices adopted Dec. 30, last. Heavy demand exists for all kinds of tubular goods. Specifications for line and drive pipe, tubing and casing are very heavy, and demand for merchant sizes is active. Jobbers in industrial centers enjoying "booms", find it increasingly difficult to meet demand for pipe of small diameter. Reports of contracts being placed for a 500-mile line, apparently refer to an order distributed last autumn.

New Factories

As a result of a new arrangement made by the Allen Motor Co., of Fostoria, O., that all the parts of the motor car produced by it be made in Fostoria, the local business men's association is preparing to take care of the several new factories which will locate there. The Allen Motor Co., will build a modern factory on a 50-acres site recently contracted for near the old Peabody Buggy Co.'s plant. The company will employ about 1,000 more men when the new factory is completed.

The Waltham Watch Co., Waltham, Mass., has given its 4,000 employes a 10 per cent increase in wages, effective Feb. 5.

Government Needs Shapes

Navy Yard Improvements Being Hurried—Bids for Crane Runways to be Received—Active Demand for Export

Philadelphia, Feb. 5.—Plans for navy yard improvements have been pushed forward by the government during the past few days. Bids will be taken Feb. 12 on 6,300 tons for two crane runways at Norfolk for the quickest delivery possible. A similar structure, 3,000 to 4,000 tons, is in the market for the Puget island yard. The American Bridge Co. has furnished the low steel bid of $106 per ton erected on 3,400 tons for a structural shop for the League island navy yard, this city. Another important new letting is about 6,000 tons for two crane runways for the Cramp ship yard.

Bids go in tomorrow on 8,000 tons for Philadelphia subways. Some eastern makers have canvassed the export orders for shapes upon their books and find that a large part of these are for South American and Asiatic shipment or to destinations not affected by the German blockade. Eastern shape mills seem more reluctant than ever to accept much additional tonnage at present. A bridge shop is having trouble getting mill space on a round tonnage for the first half. An inquiry for 25,000 tons covering prospective work recently has been circulated by a large eastern shop. In ship shapes, for which 4c, Pittsburgh, is quoted, 2,500 tons for last and first quarters of 1918 is asked by an Atlantic coast builder. The minimum eastern shape price is 3.25c, Pittsburgh, with 3.50c quoted by some makers and 3.75c actually obtained on small lots.

Fabricated Material Active

Pittsburgh, Feb. 6.—Heavy demand exists for fabricated material for new plants, additions and extensions. Specifications against contracts have not fallen off, and new orders involve tremendous tonnages in the aggregate. No difficulty has been experienced in selling material at 3.25c for delivery at the convenience of the maker. Fabricating shops are being operated at maximum capacity, and most of them have enough tonnage on hand to maintain present operating schedules well into the third quarter of the year.

Shape Demand Larger

Chicago, Feb. 6.—Structural shops are receiving unusual demand for fabricated material and some contracts are being placed now to be filled from stock in the warehouse of the fabricator without recourse to mills. An unusual tonnage of structural material was closed in the past week in the west, covering a number of projects. The largest of these involves 1,438 tons for a high school in Chicago, which will be furnished by the South Halsted Street Iron Works. The Pullman Co. has placed 1,000 tons with the American Bridge Co. for a hammer and forge shop and 263 tons for a truck shop with the McClintic-Marshall Co. The Oliver Iron Mining Co. has placed with the American Bridge Co. 562 tons for mine work at Ironwood, Mich.

CONTRACTS AWARDED.

Lindblom high school, Chicago, 1,438 tons, to South Halsted Street Iron Works.

Pullman Co., hammer and forge shop, Pullman, Ill., 1,000 tons, to American Bridge Co.

Oliver Iron Mining Co., mine repair material for Norris Aurora mine, Ironwood, Mich., 562 tons, to American Bridge Co.

St. Louis & San Francisco railroad, Big Warrior river bridge near Cordova, Ala., 518 tons, to Virginia Bridge & Iron Co.

Isle Royale Copper Co. houses, shops and warehouse at Isle Royale mine at Houghton, Mich., 384 tons, to Worden Allen Co.

Pullman Co., truck shop at Pullman, Ill., 263 tons, to McClintic-Marshall Co.

Cudahy Packing Co., Chicago, 250 steel channel car underframes, 208 tons.

Mercer Fraser Co., two spans for Santa Ynez river bridge, Santa Barbara county, Cal., 190 tons, to American Bridge Co.

Freer collection building, Washington, 300 tons, to Dietrich Bros.

Bridge for Baltimore & Ohio railroad at Baltimore, 200 tons, to an independent shop.

CONTRACTS PENDING.

Two crane runways for the Norfolk navy yard, Norfolk, Va., 6,300 tons, bids to be taken Feb. 12, quickest delivery requested.

Crane runway for Brementon, Puget Sound, navy yard, 3,000 to 4,000 tons, plans issued for early bids.

Two crane runways for the Wm. Cramp & Sons Ship & Engine Building Co., Philadelphia, 6,000 tons, bids being taken.

Structural shop for the League island navy yard, Philadelphia, 3,400 tons, B. F. Gormely, of Washington, low bidder on general contract, using the American Bridge Co.'s tender on the steel.

Three subway sections, Philadelphia, 8,000 tons, bids taken on Feb. 6.

New Members of Pickands Mather & Co.

Pickands, Mather & Co., Cleveland have just made formal announcement of the election of the following to membership in the firm: William McLauchlan, George H. Beaumont and George D. Cameron.

Mr. McLauchlan is head of the pig iron sales department of Pickands, Mather & Co., and has held that position for many years. He is one of the best known and most highly regarded pig iron sales authorities in the country. Mr. Beaumont for years has occupied the position of iron ore and blast furnace expert of the firm and is known throughout the country as a leading authority on furnace practice. Mr. Cameron is connected with the coal sales department of the firm with W. P. Murray.

(*For complete prices see page* 396)

Tungsten Market

Is Affected by Germany's New Submarine Policy

New York, Feb. 5.—A number of comparatively large tonnages of tungsten concentrates are pending in this market. Several of these are for export and action on them is being held up due to the uncertainty which the new German submarine campaign has injected into the shipping situation. Most American sellers, for a long time past, have been quoting exclusively on the basis of f. o. b. New York, leaving the matter of securing cargo space to the buyers, so that the latter, before closing under present circumstances, want to assure themselves that the material can be shipped. A number of domestic users are in the market for tonnages of various sizes, including one of nearly 300 tons for forward delivery.

The only change in the situation as to prices is that scheelite is not offered at some of the extremely low prices heard a week or 10 days ago. The market on guaranteed minimum 60 per cent tungsten concentrates, low in impurities now may be quoted at $14 to $16.50. On concentrates having a higher tungsten content, and which are particularly free of objectionable elements, such as tin, sulphur, arsenic and phosphorus, higher prices are being done. This, of course, is in line with the policy, which a number of sellers have been following, of asking a premium of 40c per unit for each unit in excess of 60. Seventy per cent concentrates, on this basis, would be commanding around $18 to $20. As a matter of fact, however, there have been sales of desirable 70 per cent concentrates at $17 to $17.50 a unit.

The market on 70 per cent ferrotungsten is unchanged at $2 to $2.50 per pound of tungsten contained. A number of tonnages, including two big lots for export, are pending.

William Pass, head of the William Pass Co., machinery dealer, died Feb. 1 in Chicago. He came from Russia 40 years ago and engaged in the business of dismantling industrial plants.

Pig Iron Output Smallest In Year

January Production of Coke and Anthracite Pig Iron Is Less Than In Any Month Since Last February—Decline Follows Congestion on Railroads—Many Stacks are Banked

THE factors, which caused pig iron production to fall off in November and December continued to exert their influence through January with the result that last month's output of coke and anthracite pig iron was the lowest of any month since February, 1916. Taking as a fairer basis the average daily output, last month's production was the smallest of any month since November, 1915. The factors which have exerted a restrictive influence during the past three months are primarily, of course, the result of the congestion on the railroads, which has retarded the furnishing of supplies in sufficient quantity.

AVERAGE DAILY PRODUCTION.

	1917.	1916.	1915.	1914.	1913.
Jan.	101,930	102,319	51,323	60,624	89,929
Feb.	.....	106,157	59,521	67,450	92,095
Mar.	.....	107,343	66,009	75,534	89,123
Apr.	.....	107,517	70,484	75,383	91,812
May	.....	108,535	72,747	67,646	90,865
June	.....	107,127	78,998	63,486	87,229
July	.....	103,907	82,687	63,075	82,525
Aug.	.....	103,156	89,510	64,403	81,839
Sept.	.....	106,935	94,478	62,757	83,137
Oct.	.....	113,167	100,656	57,007	81,933
Nov.	.....	110,593	101,174	50,042	74,322
Dec.	.....	102,715	103,278	48,236	63,746
Av'ge	101,930	106,610	81,022	62,934	83,980

This failure to receive supplies, particularly coke, sufficient to operate blast furnaces at capacity, has caused a considerable decline in the number of active stacks. On Jan. 31, 310 furnaces were in blast, a gain of only one over the number active on Dec. 31. Two months ago, that is, on Nov. 30, 322 furnaces were active, while on Oct. 31, 328 were in blast.

The total production of coke and anthracite pig iron in January amounted to 3,159,839 tons, compared with 3,184,178 tons in December, a loss of 24,339 tons. A comparison of the average daily production for the two months shows a loss of 785 tons, the daily average for January being 101,930, and for December, 102,715 tons.

This decrease in production is due entirely to the steel-works or non-merchant furnaces, which produced only 2,297,394 tons in January, compared with 2,331,786 tons in December, a net loss of 34,392 tons. The total production of merchant furnaces in January shows a gain of 12,256 tons, the figures for January and December being 819,874 tons and 807,618 tons, respectively. The average daily production of steel-works furnaces shows a loss of 1,110 tons in January, while the merchant furnaces gained an average of 396 tons a day.

The production of spiegel continues to show a decline, the loss for January being 5,101 tons. The total production of spiegel in January amounted to 14,096 tons, compared with 19,197 tons in December and 22,653 tons in November. There were 28,475 tons of ferro produced in January, a gain of 2,898 tons compared with December, in which month the production amounted to 25,577 tons.

Nine merchant furnaces were placed in blast last month, while seven were taken off the active list, making a net gain of two. The steel-works furnaces show a loss of one, seven having been put in operation, while eight were taken off the active list.

Heavy Inquiry

For Steel Comes From All Directions —Active Foreign Demand

New York, Feb. 7. (By wire.)—Heavy new inquiry for steel from all directions continues and war threats have stimulated rather than depressed certain branches. The government is in the market for round tonnages of munitions steel and supplies. Large new demands are coming from ship yards. Spanish builders want large amounts. Foreign interests are calling for about 75,000 tons of plates for oil tanks largely in Mexico. Tin plate is very scarce and probably a half million boxes for export are waiting for mills to take them.

South America buys about 4,000 tons of wire products of the Corporation. Car builders are active in the market. Two western roads have placed 57,000 tons of rails for third quarter of 1918. France wants 75,000 tons and an English road still is negotiating for 5,000. A Cuban inquiry calls for 10,000.

About an even break is expected in the Corporation's unfilled tonnage for January. Production of the leading interest last month was cut considerably by operating difficulties, which continue with slight change. A number of Corporation furnaces are still banked.

MONTHLY PRODUCTION.

	1917.	1916.	1915.
Jan.	3,159,839	3,171,878	1,591,024
Feb.	.....	3,078,548	1,666,592
Mar.	.....	3,327,630	2,046,280
Apr.	.....	3,225,496	2,114,518
May	.....	3,364,584	2,255,157
June	.....	3,213,818	2,369,932
Total 1st half.	.....	19,381,954	12,043,503
July	.....	3,221,127	2,563,311
Aug.	.....	3,197,838	2,774,825
Sep.	.....	3,208,041	2,834,342
Oct.	.....	3,508,180	3,120,340
Nov.	.....	3,317,805	3,035,235
Dec.	.....	3,184,178	3,201,605
Total 2d half	.....	19,637,169	17,529,658
Grand total	3,159,839	39,019,123	29,573,161

John H. Allerdyce, promoter of the Detroit, Armada & Thumb railroad, announces that construction of the new road to Armada will begin early in the spring.

JANUARY PIG IRON

States.	No. of stacks.	No. in blast last day of month. Jan.	Dec.	Total tonnage made. Merchant.	Non-Merchant.	——Totals—— Jan.	Dec.
Pennsylvania	155	121	120	243,082	1,021,444	1,264,526	1,271,373
Ohio	77	65	63	160,834	527,501	688,335	688,436
Alabama	45	30	29	151,397	98,408	249,805	237,987
Virginia	22	8	9	34,445	.....	34,445	32,618
New York	26	15	18	60,958	99,821	160,779	134,223
New Jersey	6	1	1	6,347	.....	6,347	6,610
Illinois	24	24	24	44,860	267,998	312,858	342,962
Colorado	6	3	3				
Indiana	10	10	10				
Maryland	4	4	4	34,448	227,207	261,655	261,847
Wisconsin	6	5	4				
Kentucky	7	4	4				
West Virginia	4	4	3				
Tennessee	17	10	10	51,786	27,967	79,753	82,976
Washington	1	0	0				
Georgia	2	0	0				
Texas	3	0	0				
Minnesota	3	3	3	31,717	27,048	58,765	60,372
Michigan	3	2	3				
Missouri	1	1	1				
Spiegel—All states						14,096	19,197
Ferro—All states						28,475	25,577
Totals	422	310	309	819,874	2,297,394	3,159,839	3,184,178

Rally to the Support of Uncle Sam

Many Manufacturers Offer Their Plants to the Government—Eight Hour Day May be Cast Into Discard

WASHINGTON, Feb. 5.—Telegrams from private manufacturers and ship builders throughout the country literally have poured in, and are pouring into the offices of Secretary of the Navy Josephus Daniels and Secretary of War Newton D. Baker pledging the support of manufacturers to the government in the present crisis. In addition, numerous manufacturers have called upon both secretaries and still are calling upon them, carrying the same mission of intense American patriotism. Among the manufacturers, producers of steel and ordnance supplies of all kinds, along with ship builders, are taking an extremely prominent part.

Have Definite Assurances.

Conferences were held today between Secretary of the Navy Daniels and Secretary of War Baker, and President E. G. Grace, of the Bethlehem Steel Corporation; J. B. Bonner, manager of sales of the Philadelphia district of the Carnegie Steel Co., who also has charge of sales to the government; a representative of the Remington Arms Co., and Henry Ford. All of the manufacturers came with the same word—that their plants are at the immediate disposal of the government for any use necessary. The maters of prices, etc., were made only an incidental feature of the talks, assurance being given by the manufacturers that no difficulty would be experienced in reaching an agreement on this point. Mr. Ford said he would make munitions without profit. The tone of these conferences, too, was representative of the dispatches received and still being received.

Mr. Grace spoke not only for the Bethlehem Steel Co., but also for its ship building plants as well. The manufacturers making personal calls, and those sending dispatches, have asked the war and navy departments to inform them of anything that they can do or should make ready to do and that instructions would be complied with in every way possible. Both Mr. Daniels and Mr. Baker have expressed their hearty gratitude at the patriotic zeal shown by the private manufacturing interests.

The Eight-Hour Law

For the immediate future, the question, it is said in high sources, is not a matter of furnishing ships and munitions, but that of supplying labor and the necessity of the government throwing overboard the 8-hour law. Officials do not appear to be at all disturbed as to the ability of the government to at once secure sufficient recruits for army, navy and aerial service, but of course it is recognized that the recruits would have to undergo intensive training before they would be finished products for military requirements.

The matter of casting aside the 8-hour law apparently is not causing any worry. It may be suspended in case of emergency by the war or navy department and in fact has been suspended recently by the latter at two navy yards. It follows that if it is found expedient this restraining law will also be cast aside as to labor being performed in private plants for the government.

One manufacturer who recently placed his plant at the disposal of the government said that all the government had to do was to make the necessary appropriations and give the manufacturers a chance and "they would do the rest". He said he had particularly in mind the matter of throwing off restrictions brought about by the 8-hour law. Contrary to one report which has been in circulation, Secretary Daniels said that the American Federation of Labor is ready and willing to have this law temporarily suspended. It was his opinion that it would not give any trouble.

New England Plants Offered

Worcester, Mass., Feb. 6.—The prospect of war being declared by the United States against Germany has stirred New England munition manufacturers to offer their plants to the government for use as quickly as it may need them. The Winchester Repeating Arms Co., New Haven, Conn., was the first to send a representative to Washington to place the facilities of its plant at the disposal of the United States, should it be required. The company employs more than 12,000 men and has been rushed making arms for the allies since the European war. The plants of the New England Westinghouse Co., in Springfield and Chicopee Falls, Mass., and in Meriden, Conn., shut down Saturday noon until Thursday for inventory and will be placed at the command of the government should they be needed. They have been filling a rifle contract for the Russian government. The plants of the Worcester Pressed Steel Co., and the Harrington & Richardson Arms Co., both in Worcester, Mass., are ready for government use any time they are needed. The former has a contract for 1,000,000 1-inch shells for the Russian government, which is half completed, work being held up on account of a shortage of brass. The plant is equipped to make shell cases of various sizes, even larger than those it made previously for England. The Harrington & Richardson Arms Co. does not make army guns, but its plant is equipped for the manufacture of parts. The Lynn, Mass., plant of the General Electric Co. has announced that no contracts would be accepted hereafter for the manufacture of shell cases for a foreign nation.

C. T. Schoen, Steel Car Man Dies

Charles T. Schoen, 72 years old, who developed the pressed steel car, died Feb. 4 at his home in Moylan, near Philadelphia, after a 10-days' illness from pneumonia. He retired from active business about 15 years ago. Previous to his retirement, Mr. Schoen was connected with the Standard Steel Car Co., having become interested in that concern after resigning as president of the Pressed Steel Car Co., Pittsburgh.

Mr. Schoen conceived the idea of pressed steel cars while employed as a salesman and engineer of the Charles Scott Spring Co., Philadelphia. He invented freight car center plates and other devices of pressed steel. The success of these inventions led to the formation of the Schoen Mfg. Co., later known as the Schoen Pressed Steel Co., and the location of a plant in Woods Run in lower Allegheny, Pa. Mr. Schoen, upon invitation of the Bessemer & Lake Erie railroad, designed a pressed steel railroad car and received a contract for 1,000 cars of 100,000 pounds capacity each. It is said that Andrew Carnegie, realizing the importance of the steel car industry, endeavored to secure control of the Schoen company, and later considered plans for the erection of a plant of his own;

these plans, however, were abandoned.

Mr. Schoen combined his company with the Fox Solid Pressed Steel Equipment Co., Joliet, Ill., and formed the Pressed Steel Car Co., capitalized at $25,000,000. An extensive plant was erected at McKees Rocks, Pa. Mr. Schoen was chairman of the board of directors of the Pressed Steel Car Co. for many years. He built a plant at McKees Rocks for the manufacture of pressed steel car wheels. This company, known as the Schoen Steel Wheel Co., subsequently was purchased by the United States Steel Corporation and now is operated by the Carnegie Steel Co.

In company with a number of friends, Mr. Schoen organized the Standard Steel Car Co., with works at Butler, Pa., after leaving the Pressed Steel Car Co. At the time of his demise he was interested in the Edgewater Steel Co., Pittsburgh, of which his nephew, W. H. Schoen, is treasurer.

Ella Furnace

Sold to E. W. Mudge & Co.—Operation by Pickands, Mather & Co.

Individuals connected with Pickands, Mather & Co., Cleveland, have sold their stock in the Ella furnace at West Middlesex, Pa., to E. W. Mudge & Co., Pittsburgh, which firm will hereafter sell the product of the furnace. The operation, including the supplying of raw materials, will continue under the direction of Pickands, Mather & Co. as heretofore.

The Ella furnace is 70 x 14½ feet. It was built and blown in in 1882 and has been remodeled several times. It has a rated capacity of 80,000 tons per annum. A short time ago the Mudge firm bought the Claire furnace, of the Claire Furnace Co., Sharpsville, Pa., which was built in 1869, and has a rated capacity of 85,000 tons. The Mudge concern also recently took over the Reliance Coal & Coke Co. properties in the Connellsville district.

Buys Rolling Mill

The rolling mill of the Penn Iron Co., Ltd., Lancaster, Pa., has been acquired by New York interests and is about to be placed in operation after an idleness of 10 years. It is reported that steel bars will be rolled. The plant consists of nine puddling and busheling furnaces, five heating furnaces and four trains of rolls, the latter including a 16-inch bar mill. The annual rated output has been 25,000 tons.

Will Make Survey

And Submit Estimate of Cost of Improving River Rouge

Detroit, Feb. 5.—Major H. Burgess, corps of engineers, U. S. A., stationed in Detroit, has been ordered by the government to make a survey of the River Rouge and submit an estimate of the cost and the work to be done. This indicates that the government will hasten the work of widening and deepening the Rouge to accommodate Henry Ford's $10,000,000 blast furnace plant and other industries.

Immediately after Major Burgess' announcement persons owning property along the Rouge began to raise valuations and while it is understood that several large industries have options on this land, others will pay fancy prices. Major Burgess met with a number of those who will establish industries along the Rouge and nearly all have agreed to donate to the government land along the Rouge for the deepening of the stream. This work will require 50 feet on each bank.

It is the intention of the government to dump dirt removed from the Rouge on the marsh lands along its shores. This will automatically redeem many acres now unfit for factory sites. The plans provide for a deepening of the stream to 21 feet for a distance of 4½ miles from its mouth. This will just cover the frontage of the proposed Ford furnaces.

Rebuilds Old Blast Furnace

The Intermont Coal & Iron Corporation, Big Stone Gap, Va., has thoroughly rebuilt the old Union Iron & Steel furnace at that place, adding new boilers, relining the stack and rebuilding the stoves. The furnace is almost ready to go into blast and will make foundry grades. The company will use native ores principally and will mine them itself. It will also make its own coke and mine its own limestone. The present owners are the Intermont Coal & Iron Corporation, with R. T. Irvine, president; J. W. Kelly, secretary, treasurer and general manager. The board of directors consists of R. T. Irvine, J. W. Kelly and L. M. Williams.

New Canadian Line

Toronto, Feb. 5.—Sir William Mackenzie, president of the Canadian Northern Railway, announces that the construction of a line from Toronto to the Niagara frontier will soon be commenced. An expenditure of about $7,000,000 will be required. Double tracks will be laid through all important centers. A bridge across the Niagara river, though not contemplated immediately, is included in the company's plans for later construction.

New Incorporation

Of the Quickwork Co.—Machines to be Made in Ohio

Announcement is made of the incorporation of the Quickwork Co. of Ohio, organized for the purpose of taking over and operating the machinery business of H. Collier Smith, of Detroit. Mr. Smith retains the controling interest and will have active charge of the operations of the company, which is capitalized at $400,000, there being no bonded or mortgage indebtedness. The personnel of the management of the business will remain unchanged, H. Collier Smith being president and general manager; H. E. Groves, vice president; A. F. Smith, secretary and treasurer; K. J. O'Leary, production manager; R. H. Sims, sales manager, and Harry G. Smith, head of the engineering department.

Quickwork machines will be manufactured at St. Marys, O., where the company has purchased a modern, well equipped plant on 21 acres within the city limits. General offices, sales rooms and show rooms will be in Detroit as heretofore.

Mr. Smith began manufacturing Quickwork machines in 1911. They embodied new principles for working plate and sheet metal, and within two years Quickwork machines were making a very large percentage of the automobile fenders in this country.

Engineers and production managers in other and heavier classes of work were close behind the motor car manufacturers in recognizng the economic value of these machines. Heavier machines were made and sold to ship yards, boiler shops, bridge builders, car shops, steel mills, navy yards and various concerns handling plate or sheet metal. The largest and heaviest machine is a rotary shear weighing 17½ tons for cutting ¾-inch plate.

New Foundry

A. Allan & Son, 486 Greenwich street, New York City, have filed plans for a new foundry to be erected at South Fifth and Bergen streets, Harrison, N. J. The structure will be 50 x 100 feet and will cost $15,300. Frederick A. Phelps, Newark, N. J., is architect and Frederick K. Kilgus, Newark, N. J., contractor. This is the first of three buildings which the company is planning to erect on this site.

New Mills

Being Added by Mansfield Company Will Double Capacity

The Mansfield Sheet & Tin Plate Co., Mansfield, O., at its recent annual meeting declared an initial dividend of 2 per cent, reports presented showing a most successful year completed. The company on Feb. 1 issued $500,000 in 7 per cent preferred stock, this following the recent increase in its capitalization from $300,000 to $1,000,000. Half of the total new capitalization will be preferred and half common stock.

These officers were re-elected: President and treasurer, William H. Davey; vice president, C. A. Auckerman; secretary, A. I. Davey; assistant general manager, Samuel Davey. The directors are: W. H. Davey, C. A. Auckerman, A. I. Davey, Samuel Davey, John Davey, B. A. Baxter and Rudolph Hartman.

The company has begun improvements which are extensive enough to double the capacity. The Massillon Bridge & Structural Co. has taken the contract for building an additional double building, 140 x 440 feet. The new mills will be housed in one building and the finishing mills in the other. The mills will be electrically driven throughout, and the Westinghouse Electric & Mfg. Co. has the contract for furnishing the motors. The new mills will include four stands 30 x 44-inch finishing rolls and the hot mills two stands 30 x 52 inches. Four stands of balanced roughing mills will be added. The cold mills will include eight stands 26 x 52 inches and four 156-inch squaring shears will be installed. This latter equipment is being furnished by the Hyde Park Foundry & Machine Co., Hyde Park, Pa. The hot mill gear drive is being furnished by the Mesta Machine Co., and the cold mill drive by the Falk Co., Milwaukee. The Alliance Machine Co., Alliance, O., has the contract for three 30-ton cranes.

Actual construction of the improvements has been commenced and it is hoped to have the new mills operating by the middle of May or the first of June.

Receiver Appointed

Robt. Wetherill, of Chester, Pa., has been appointed receiver of the Standard Cast Iron Pipe & Foundry Co., Bristol, Pa., and has been given authority by the court to operate the plant for 90 days. The assets of the company are estimated at about $2,100,000 and the liabilities at approximately $1,000,000. The Standard Cast Iron Pipe & Foundry Co. is an important eastern producer of cast iron and operates a large modern plant at Bristol, Pa.

Doubles Contracts

For Extensions to League Island Yard, Philadelphia

New York, Feb. 7. (By wire.)—The government has doubled contracts for extensions at League Island yard, Philadelphia, and these now call for 17,000 tons, which will be supplied by the American Bridge Co. Additional shops and other buildings are covered by this tonnage. The original contract was for 8,400 tons. The government also asks for 500 tons for a hangar at Pensacola.

New inquiry on structural jobs is keeping up and buyers are little swayed by war talk. The Pennsylvania asks 1,000 tons more for bridge work. The Keystone State Construction Co. is low bidder on Philadelphia subways, 8,000 tons. Plain material is strong and unchanged.

A prominent machinery house here has inquired for 40,000 tons of 4⅜-inch rounds for Italy, thought to be for axles.

Ready to Meet Country's Call

New York, Feb. 6. — Judge Gary, chairman of the United States Steel Corporation, was asked by *The Iron Trade Review* whether the Corporation would, in case of war, place its plants at the disposal of the United States government, replied: "We have not considered the question nor been asked to do so. We have many times and in many ways shown a disposition to accommodate the government when requested and if it should become necessary, to lend our assistance in times that are critical, we would assume the attitude which might be expected of all loyal citizens."

Some of the leading independent steel companies' executives in this city, have placed both their plants and their organizations at the government's call.

The Burdett Oxygen Co. will begin operation of its Oklahoma plant, located at the Stock Yards Station, Oklahoma City, on Feb. 15, and will be in a position to furnish oxygen to users in that territory. This is the twelfth plant installed by the Burdett company in the various industrial centers of the country.

The Non-Ferrous Metals

Copper Lead Spelter Tin

New York, Feb. 6.—Developments following upon the heels of Germany's announcement of ruthless submarine warfare last week have been reflected to a considerable degree in the metals markets here. Tin immediately started climbing and at present is holding around 56c to 58c, New York, for spot shipment, a gain of almost 10 cents. Lead also for some unaccountable reason took a brace, advancing during the first couple of days and then holding very steady ever since. The effect on copper and spelter was to lower prices. Aluminum prices also were slightly easier. In fact, the only metal not affected by Germany's latest announcement was antimony. This is due principally to the fact that this metal can go by way of the Pacific coast.

Yesterday and today the copper market has been somewhat stronger and at this time it may be quoted in terms of cash as follows: Electrolytic, prompt and February, 32.50c; March, 32c; April, 31.50c; and May and June, 30.50c to 31c. Lake copper is holding nominally at 32c, New York, for prompt and February, and 31.50c for March. Casting copper is quoted 29c to 29.50c for February and 28.50c to 29c for March.

Spelter, which also has firmed up during the past two days, is quoted as follows: Prompt, 10.25c; February, 10.12½c; March, 10c; and second quarter, 9.50c, all St. Louis base. Brass special for prompt shipment now is holding at 11.25c, St. Louis.

Inquiry for antimony is greatly improved. There is a large inquiry out for future delivery and demand for spot is of lively proportions. Due to the scarcity, spot antimony now is held at 27c to 28c, duty paid, while in some cases higher is asked. The leading Chinese producer has withdrawn quotations for the time being.

The tin market at present cannot be represented by any definite quotations since the prices actually done and the prices asked by different sellers vary widely. In some cases spot Straits is held at 60c, while in others asking prices range between 57c and 58.50c. It is reported but not verified that one sale of spot Straits was made today at 55c. The situation, of course, is dominated by the submarine menace which, the trade generally believes, at least to some extent will result in the loss of tin cargoes at sea.

A quiet but sustained demand for lead, combined with a scarcity of this metal for prompt and nearby consumption, keeps prices on the incline. February lead has been sold at 8.50c, St. Louis, and the market now may be quoted at 8.25c to 8.50c, St. Louis, for February, and 8.12½c to 8.37½c, for March. Lead in the east is exceedingly scarce due to the extent to which the railroad congestion in the middle west continues to delay shipments. The American Smelting & Refining Co. continues to quote 8c, New York.

The market on aluminum is dull and somewhat easier. The market on prompt and nearby carloads may be quoted as follows: No. 1 virgin 56c to 58c; No. 1 remelted 51c to 53c; No. 12 alloy 38c to 40c.

(For complete prices see page 396)

Heat Treating Shrapnel Forgings

Systematic Methods of Hardening and Quenching Developed to Meet the Exacting Requirements of Automobile and Machine Tool Builders Have Played an Important Part in the Manufacture of Munitions

THAT the manner of cooling heated iron or steel has a direct influence upon the physical properties of the metal, has been known for many years, but it has remained for modern metallurgists to marshall the facts regarding heat-treatment into an exact science. Recent developments have laid bare the secrets of toolmakers, who for a time astonished laymen by their skill in producing forgings of unusual strength, hardness, or tenacity, at will, by varying the handling of the metal in the furnace and the quenching bath. Heat treatment has become a systematized process in which guesswork has been eliminated. It is a boon of unlimited value to modern manufacturers of steel products.

Advanced to its present status of development by the exacting demands of automobile, aeroplane, locomotive and machine tool construction, heat treating was readily applicable to the manufacture of munitions, an industry widely introduced in the United States by the European war. In fact, it is doubtful if the wonderful strides made in shell making since the civil war would have been possible if it had not been for the additional facilities for refining steel offered by heat treating.

An excellent example of the important part played by this new metallurgical art in munitions making is found in the methods of the Hofman plant of the Symington Machine Corporation at Rochester, N. Y., where 75-millimeter Russian shrapnel are being made at a rate of over 15,000 per day. The heat-treating department in this plant has been developed to an unusual degree of efficiency, and has been largely responsible for a remarkably low percentage of rejections. A general description of the Rochester plant appeared in the January 4 issue of *The Iron Trade Review*.

Prescribing Proper Treatment

The rough forgings come to the Hofman plant in carload lots of 5,000 to 6,000. They are approximately 10 inches long and about 3 inches in diameter. The side walls are about ¾-inch thick and the solid end is about 1 inch thick. The forgings arrive in the heat-treating department after the open ends have been cut off, the outside rough-turned, the inside rough-bored, and the powder pocket, as the cavity in the lower part of the shell is called, has been partly formed. As briefly explained in the Jan. 4 issue, a symbolic key to the analysis of the forgings, which is stenciled on each piece remains with each shell throughout all of the machining and heat-treating operations; it is restamped whenever a cutting tool removes a symbol. Forgings from the same heat are handled together, and this enables the foreman of the heat treating department to prescribe for all of the forgings of the same analysis at one time. Cards which accompany each consignment of forgings indicate the number of pieces in the heat, and records prepared at the end of each 8-hour shift show the number of forgings in the heat that have been treated, and the number yet to be treated.

The heat-treating room is approximately 150 feet long and 60 feet wide. The roof of the original building was raised to provide an adequate circulation of fresh air to eliminate the fumes, and an unusually large monitor with louvres on all four sides was erected to assist in the circulation. From the standpoint of healthful working conditions, the effect has been all that could be desired. Fig. 1 is a general view of the furnace room.

The equipment for hardening the shell forgings consists of three twin-chamber double-end overfired oil furnaces built by the Metals Production Equipment Co., New York, successor to the Quigley Furnace & Foundry Co. The combustion chamber of each of these furnaces is above the working chamber, and is separated from it by a perforated arch of refractory tile. The oil is delivered from overhead feed lines to five burners at each side of a two-unit battery of furnaces. The oil is atomized by steam delivered to the burners at 80 pounds pressure. The flame of combustion is retained in the combustion chamber

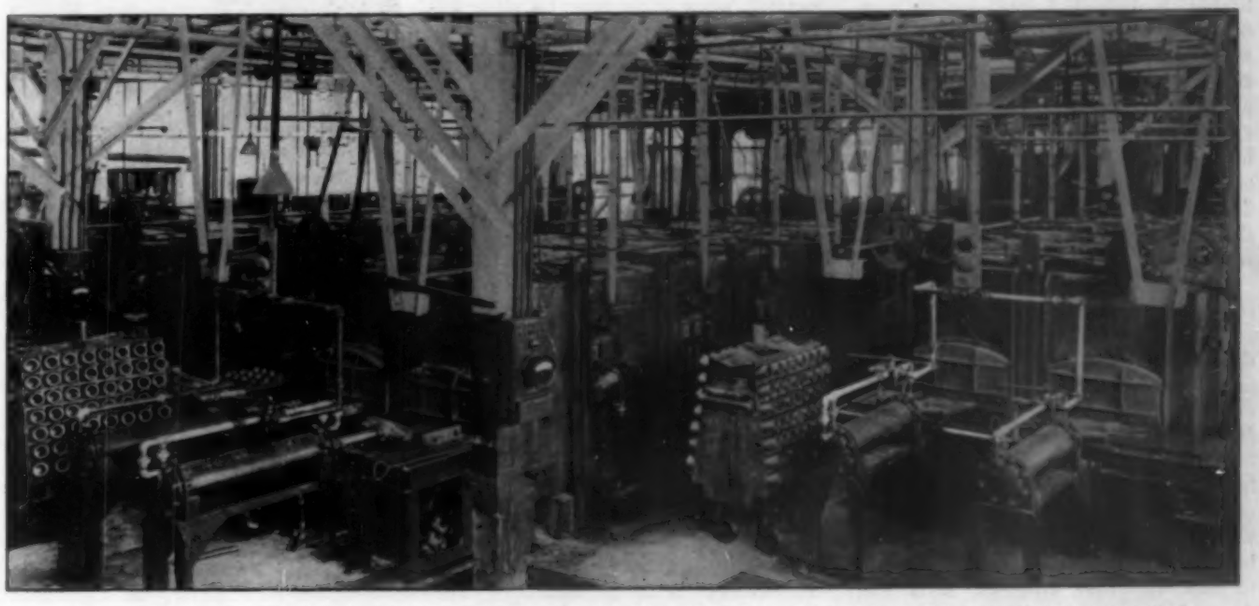


FIG. 1—GENERAL VIEW OF HEAT-TREATING ROOM IN THE HOFMAN WORKS OF THE SYMINGTON MACHINE CORPORATION

FIG. 2—BATTERY OF PYROMETERS FOR HEAT-TREATING FURNACES

and the heated gases flow down through the checkered refractory arch into the working chamber containing the shell forgings. After circulating in this chamber, the gases pass out through an outlet in the side wall, into a duct under the chamber, and up through flues in the other side wall to vents in the top.

The forgings are brought to this room in four-wheeled trucks which have compartments for 112 shells, 56 on each side. The roughly machined forgings are placed on metal trays about 18 inches long and 6 inches wide which have four cone-shaped projections providing a convenient means of quickly spacing four shells at the proper distance apart so that the heat of the furnace may circulate between them. Hydraulically operated cylinders, as clearly shown in Fig. 3 are fitted with plungers having horizontal heads, which push three trays of shells into the furnace when water under 70 pounds pressure is admitted to the cylinders. As the plunger begins to advance, an operator opens the counterweighted furnace door by means of a hand lever. The sequence of operations is such that the door is open just long enough to allow the trays to enter the furnace, thus conserving heat to a considerable extent.

After the furnace has been filled with trays of forgings, each succeeding group of three trays that is pushed in through the door at the front pushes all the others before it, so that the last one emerges from the door at the back. As the shells leave the furnace, an operator inserts the hooks of a two-pronged rake into holes in each tray, and by a quick movement, pulls it forward on smooth ways to a stop. This operation is shown in Fig. 5. The impact is just sufficient to toss the four forgings, solid end down, into a rectangular chute leading to a large reservoir of quenching oil. The empty trays are drawn to one side and placed on a link conveyor which carries them back to the front of the furnace. The conveyor is driven from a line shaft, the speed reduction being accomplished by a belt, and gears.

How Guesswork is Eliminated

The forgings are subjected to a temperature of about 1,500 degrees Fahr. for a period of one hour and 20 minutes. A novel device for regulating the movement of the shells through the furnace has been adopted. It was determined that in order to subject each group of forgings to the heat of the furnace for exactly the required length of time, three trays must enter the furnace every five minutes. To insure a strict observance of this schedule, an electric gong was installed to warn the operator when it is time to place another group of trays in the furnace. One of these groups is shown in Fig. 3. The ringing of the gong is timed by a revolving drum driven by a small direct current generator and motor. This apparatus is similar to that used for operating automatic electric signs, and since the miniature power plant is self-contained, the electric contacts made by the revolving drum are accurately and uniformly timed. The timing of the two chambers of each furnace is arranged so that trays of shell forgings are fed alternately. Thus the gong rings every 2½ minutes, permitting the operator to maintain the 5-minute schedule for each unit of the furnace.

As the four shells from each tray are plunged into the quenching oil, they roll on the inclined floor of the reservoir into a lattice-work metal basket. This basket is approximately the shape of half a cube, the bottom being inclined at an angle of about 35 degrees from the horizontal. The front wall consists of a swinging gate, pivoted at the top. The basket slides in vertical guides like the

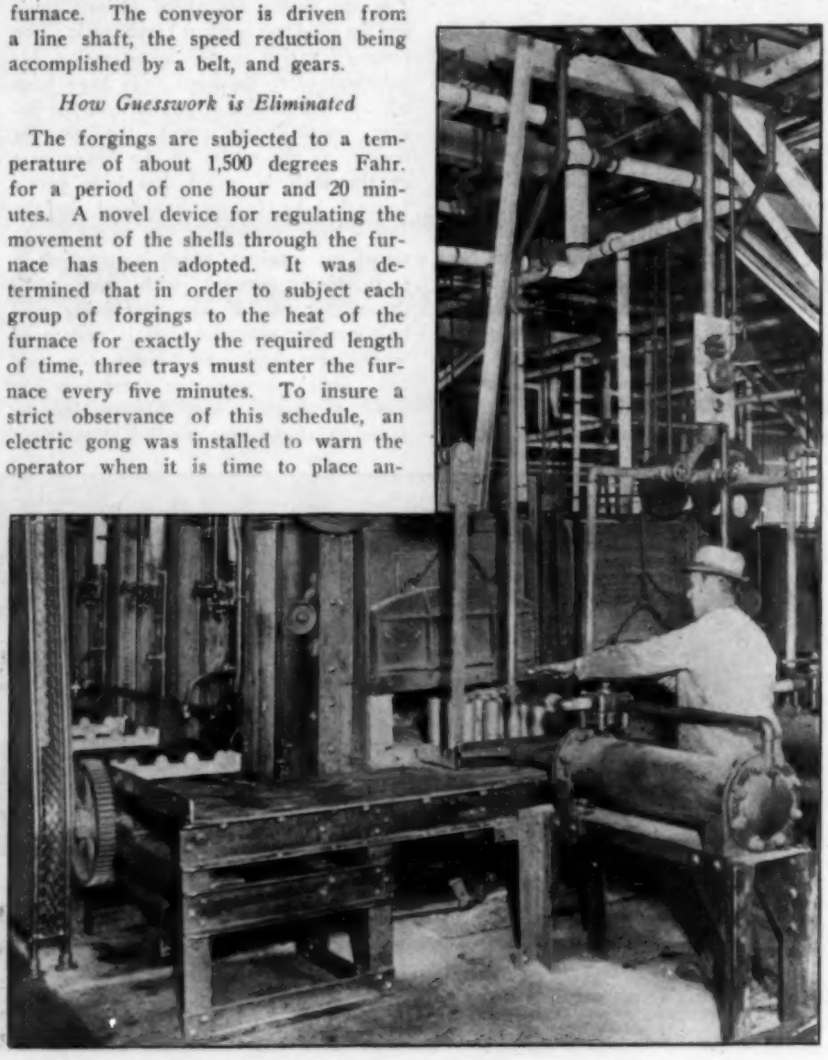


FIG. 3—METHOD OF CHARGING HEAT-TREATING FURNACES—EMPTY TRAYS ARE SHOWN AT THE LEFT

common type of freight elevator, and is operated by means of a cable and drum driven by a friction clutch attached to a line shaft. As the basket is elevated to the level of an inclined dripping pan, shown in Fig. 4, a catch which holds the front door in place is released, allowing the shell forgings to roll into the lower part of the pan where the oil is drained through the perforated floor.

The oil reservoir contains 8,000 gallons of oil which is maintained at a uniform temperature of 120 degrees Fahr. by an extensive circulating and refrigerating system.

The shells are taken from the drip pan, placed in compartments in a hand truck, and taken to one of the drawback furnaces. Each of these units is of the double-end, single-chamber type. Twenty-one forgings are placed in a furnace at a time on a rectangular-shaped tray, the shells resting on 21 bolts or studs which prevent the forgings from shifting as they pass through the furnace. The temperatures range from 1,050 to 1,250 degrees Fahr., and each group of forgings are subjected to this heat for one hour and 40 minutes. This treatment relieves the strains set up in the metal during the hardening process in the first heat-treating operation, and transforms the forgings of glass-like hardness to those of uniform toughness which can be machined and yet conform to the rigid specifications of the Russian commission.

FIG. 5—DRAWING TRAY OF FORGINGS FROM THE FURNACE

Recording Pyrometer Equipment

The door at the rear of each drawback furnace opens onto a small table whose surface is approximately 4 feet from the floor. An operator pulls the tray onto the top of a four-wheel truck which is the same height as the furnace table. The truck is then wheeled to the annealing equipment for the final heat-treating operation.

All of the furnaces are equipped with automatic recording pyrometers which are arranged on shelves in a room adjoining the superintendent's office. The pyrometer equipment was manufactured by the Taylor Instrument Co., Rochester, N. Y. Fig. 2 shows a battery of these pyrometers.

One of the remarkable features of shell making is the manner in which the conical-shaped nose is formed on the open end of the shrapnel forging. In the English 18-pound shrapnel this method is an actual necessity, because the disc-shaped casting, which forms the top of the powder pocket and whose diameter is greater than that of the opening of the shell after the nose has been formed, can not be placed in its proper position if the nose is machined. Moreover, the compressing of the end to form the nose eliminates a formidable number of difficulties in forging and in machining, to say nothing of the reduced amount of metal required. The mechanical method of pressing the open end of the forging owes its success to the physical properties imparted to the metal in the annealing process.

Each annealing furnace consists of an ordinary rectangular combustion chamber with an arched roof of refractory brick. A cast iron pot containing approximately 400 pounds of lead rests in a depression in the arch, and is heated by the gases from the chamber below, which reach a temperature of approximately 2,000 degrees Fahr. The shells are placed open end down on pegs which project from the bottom of the lead pot. About 2 inches of the forging is immersed in the lead. A layer of crushed charcoal on the surface of the lead reduces oxidation, a precaution which prevents the escape of poisonous lead fumes into the atmosphere. The charcoal also prevents the lead from adhering to the ends of the forgings,

FIG. 4—ELEVATOR FOR LIFTING FORGINGS FROM THE RESERVOIR OF QUENCHING OIL

An operator on one side of each annealing furnace removes the shells from a truck and places them on the pegs of the lead pot. After they have been subjected to the bath for a period of about 10 minutes, an operator on the other side of the furnace removes them and places them in a cooling table, consisting of a rectangular tray equipped with a perforated sheet of metal having 15 circular openings for the forgings. The bottom of the tray contains a layer of finely ground mica, to retain the heat. The forgings remain in the mica for about 20 minutes, and are then placed in trucks and taken to the machine room for final machining. The shells are handled by means of special tongs during the annealing process. The furnaces

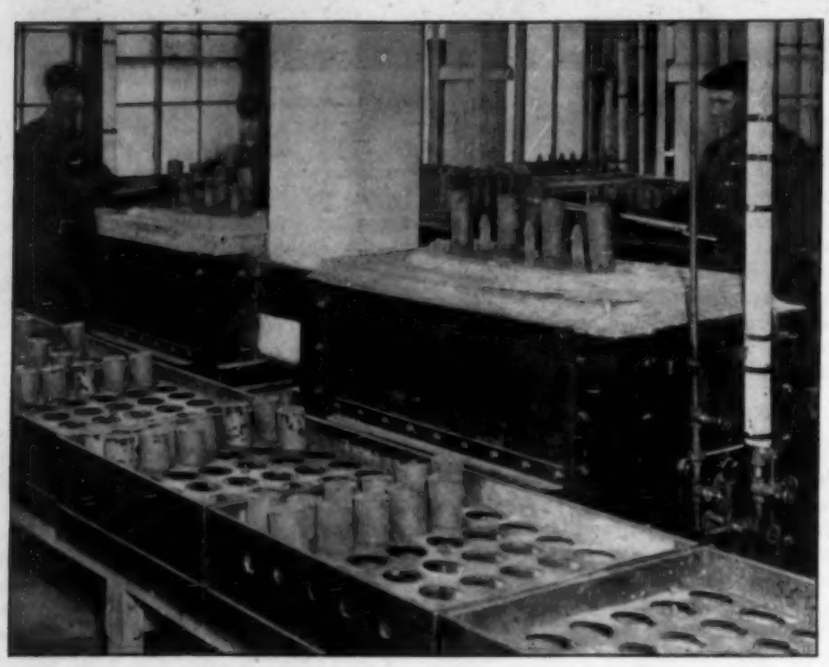


FIG. 6—ANNEALING FURNACES AND COOLING TABLE

and cooling table are shown in Fig. 6.

A severe test of the efficiency of the heat-treating operations comes when the shells are placed in large stamping presses which close in the ends to the shape of a frustrum of a cone. This is done by means of dies which shape the metal in the cold state. In spite of the severity of this mechanical treatment, the metal stands up under this operation so perfectly that the bourrelet, the point of greatest diameter which is only a fraction of an inch from the portion of the forging under the stress of compression, is unaffected, and after the nose is formed, corresponds exactly to the dimensions obtaining before the shell was placed under the dies of the press.

Even a greater test of the efficiency of this method of heat treating was furnished when a forging was accidently placed in a press in an inverted position. It was expected that such abuse could only result in breaking the shell into fragments, but contrary to this belief, the open end assumed the shape of an equilaterial triangle, and with the exception of this deformation and a few dents on the base of the forging, every dimension of the shell, even including the diameter of the bourrelet, was perfect.

Improved Method of Casting Ingots

In a report submitted to the rail committee of the American Railway Engineering Association, December, 1916, W. C. Cushing, chief engineer maintenance of way, Pennsylvania Lines, calls attention to the method of casting ingots with the large end of the ingot mold up as one of the improvements in the process of steel rail manufacture that might well be made to insure stronger, tougher and harder metal. The practice would make rails more resistant to fracture, crushing of the structure, and abrasion, than is the present product.

The railway companies are doing their share in introducing heavier and stronger rail section, but find that the quality of material is not improving as rapidly as desired. The reduction in the number of rail failures annually, as indicated by the latest studies of rail failure statistics, has been due, in addition to the increased weight, strength and stiffness of rail sections, to improvements in the specifications, which bring about a larger discard from the top of the ingot, and a more rigid inspection of the fracture of the test piece, which has been extended in some cases to every ingot.

These changes have not brought about, except to a minor extent, an improvement in the quality of the remaining material itself, which is the material put into service, and consequently fractures, transverse fissures, split and crushed heads and cracked webs are still occurring.

The effort, therefore, to effect changes in practice of manufacture, which will eliminate the transverse fissure and make the material tougher and harder and more homogeneous, must be continued.

There seems to be no doubt of the value and efficacy of the method of casting ingots with the large end of the ingot mold up. Such a method is already in use in some of the manufacturing plants of the United States and where it has been used the results are considered as satisfactory.

This is only one of the methods of improvement in rail manufacture, others having been called attention to at various times, such as the use of the "sink" head and greater care in arranging and handling the rails when cooling.

Production of Copper

In Mineral Resources of the United States for 1915, United States Geological Survey, B. S. Butler brings out some interesting statistics relative to the copper industry. After the beginning of the European war in August, 1914, many of the large copper companies in the United States curtailed their output by from 30 to 50 per cent, and many of the smaller companies ceased operations entirely. This condition prevailed until early in 1915, when the price of copper began to advance, and of course, the production began to increase. Before the middle of the year most companies were operating at full capacity, and in the second half of the year plants were pushed to the utmost. The total output for the year was the largest in the history of the industry.

The total amount of refined copper in 1915 was 1,693,779,138 pounds, which is the largest amount ever produced in a single year. The average cost of producing electrolytic and casting copper, as compiled from the annual reports of companies giving this item, was 7.86 cents, as compared with 8.62 cents in 1914. The average price for electrolytic copper, New York quotations, for 1915 was 17.47 cents a pound, as compared with 13.3 in 1914, a difference of 4.17 cents.

The Function of Alumina in Slags

Many Metallurgists Have Been in Favor of Assigning to Alumina the Role of Base in the Composition of Slags—The Author Believes That Aluminum Oxide Has an Acid Character

BY CARL HENRICH

THAT portion of the discussion by Anton Eilers referring to the high-lime and high-alumina slags made by August Raht in 1881, while smelting the Horn Silver ores at Franklin, Utah, has been read with particular interest by metallurgists. The two analyses of such slags, furnished by Mr. Raht to Mr. Eilers are shown in Table II.

The nearest approach to a simple formula expressing the average composition of these slags, which I can figure, is

$$9RO.Al_2O_3.6SiO_2.$$

Allowing a ratio of 4FeO = 5CaO, we have for this formula: SiO_2 = 35.0 per cent; Al_2O_3 = 10.0 per cent; CaO = 27.0 per cent; FeO = 28.0 per cent; in round numbers. This would be a singulo silicate of CaO and FeO with about 34 per cent or one-third of the RO bases replaced by Al_2O_3.

However, it has always appeared to me to be an absurdity to force a sesquioxide to replace FeO or CaO or any other RO, simply to make the analysis of some slag or mineral fit into some orthodox formula. That Al_2O_3 can be substituted for Fe_2O_3 or Cr_2O_3, just as MgO, CaO, BaO, Fe_2O_3, and MnO can be substituted for each other in various chemical combinations, is well established. But I do not know of any natural silicate in which it has been shown conclusively that Al_2O_3 would take the place of RO, and it is not believed that alumina will do it in any artificially produced slag silicate.

If in the above slags we consider alumina as an acid, i. e., the slags as mixtures of silicates and aluminates, we find that they satisfy, or closely approach the formula:

$$(9RO.5Al_2O_3) + 6(6RO.5SiO_2).$$

In short, assuming alumina as an acid, $2Al_2O_3$ would be the equivalent of $3SiO_2$, or 102.8 mass-units of alumina would be the equivalent of 90 mass-units of silica, and the oxygen ratio of the correct slag of the above type would be 5:3. The slag would be essentially a lime-iron 5:3 "silic-aluminate".

Slag No. 1 corresponds very nearly to this degree with an oxygen ratio of 23.2:13.8. Slag No. 2 does not correspond so well, and it is also metallurgically slightly inferior to No. 1 as shown by the lead and silver contents. On the supposition of Al as basic, the increase in the silica of this slag should make it better metallurgically than No. 1, which, however, is evidently not the case.

Alumina in Role of Acid?

Many metallurgists are unwilling to assign to alumina the role of an acid or to consider it as a substitute for silica in the calculation of their slags. Except in iron blast furnace practice, it is of no great importance whether we consider it as a base or an acid or do not consider it at all. As the insoluble residue of ores or limestone is frequently calculated as silica, it is automatically assigned to the role of an acid. But practical metallurgists have, as a rule, avoided the issue by following Kerl's advice and have kept the alumina of their slags as low as possible, so low, in fact, that usually it has been immaterial which way the alumina has been regarded. The metallurgist in a modern centrally situated blast furnace plant can do this, but occasionally the alumina problem becomes a serious one to the metallurgist at an isolated plant, smelting, perhaps, the ore from only one mine, so that the question has its interest from a practical as well as from a scientific side.

In any slag the chief points of interest are:

The formation and melting points, since these determine coke consumption and furnace temperature; its viscosity, which must be small, both to allow it to flow readily from the furnace and to permit a quick mechanical separation of it from the matte, speiss or metal; the chemical composition, since it must not dissolve large quantities of the valuable constituents of the ore, and must occasionally remove detrimental ones, as in iron smelting.

In general, an increase of alumina or silica will raise the formation temperature of a slag, and ordinarily it will be made thereby more viscid at or near its formation temperature; but these qualities are likewise affected by the various bases entering the slag and their relative proportions.

As practical experience has ordinarily shown that scaffolds over the tuyeres, and hard slag and metal taps resulted from high alumina, among the bases in unisilicate and sesquisilicate slags, alumina has acquired a bad reputation among lead and copper smelters.

It is a well-known fact that suddenly cooled slags, i. e., "chilled", are more quickly attacked by hydrochloric acid than if slowly cooled. This suggests that the crystalized and crystalline minerals occurring in slowly cooled slags are not contained as such in the molten magma, but are only formed from the original magma during the cooling process.

Among the cases in which high alumina in the smelting charge became a practical problem were the Horn Silver ores smelted by Mr. Raht in 1881, already mentioned, the oxidized ores of the early days of the Copper Queen at Bisbee and the Detroit Copper Mining Co. at Morenci and my own experiences in smelting some ores of the Champion and United Copper Mines near Nelson, N. Z.

Effects of High Alumina

In those times we considered alumina as a base when we considered it at all. The behavior of the slags calculated in this way was often a sore puzzle to me. For instance, I give below two slags made at Morenci about 1884. No. 1 was a good slag, keeping the furnace open and running freely, the other was a bad slag, inclined to form noses and scaffolds above the tuyeres, thick, sticky and sure to bring the smelting campaign to an abrupt end if not promptly changed.

The oxygen ratio, considering alumina as a base, does not throw any light on the radically different nature and behavior of these slags. The only thing which at that time seemed feasible to me, was to follow Kerl's rules as far as possible, and keep the alumina low.

At Nelson, N. Z., the problem of smelting copper ores with no available flux but magnesium limestone was confronted. The ore was mainly chalcopyrite, with some pyrite, in a gangue locally known as serpentine. The average composition of the country serpentine on both sides of the lode serpentine appeared to have the approximate formula $3MgO.Al_2O_3.3SiO_2$ or about 30 per cent MgO, 25 per cent Al_2O_3 and 45 per cent SiO_2.

The lode serpentine, forming the gangue of the ore, approached more nearly the composition of $4MgO + 4Al_2O_3 + 5SiO_2$, or about 17.5 per cent

To be presented at the New York meeting of the American Institute of Mining Engineers, February, 1917.

Table I

Analyses of Detroit Copper Mining Co.'s Slags

	Slag 1.	Oxygen percentage.	Slag 2.	Oxygen percentage.
SiO_2	34.3	18.3	38.1	20.3
Al_2O_3	11.8	6.5	16.9	7.9
FeO	38.5	8.6	33.1	7.4
CaO	10.1	2.9	8.0	2.3
MgO	2.3	0.9	2.2	0.9
	97.0	....	98.3	....

Oxygen ratio	Slag 1.	Slag 2.
Al_2O_3 base:	18.3:17.9	20.3:18.5
Al_2O_3 acid:	23.8:12.4	28.2:10.6

MgO, 43.5 per cent Al_2O_3 and 39 per cent SiO_2. One actual analysis of the gangue of roasted ore figures 36 per cent SiO_2, 46 per cent Al_2O_3 and 18 per cent MgO. That silica-alumina ratio in the available ore of the smelting charge was a decided and puzzling novelty. Kerl's advice was evidently not applicable in this case. The following slag analyses and appended remarks indicate the principal features discovered in smelting that ore:

1. Slag of first trial run, which was very short. Scaffolded and froze up. Furnace: 36-inch round water-jacketed (1884) Arizona copper furnace.

2. Slag from same run, when furnace began to scaffold.

3. Same run. From chilled scaffold above tuyeres.

4. From second equally short run. Somewhat better roasted ore, more coke and somewhat higher blast pressure. Thick, gluey slag from slag-tap. Scaffolding.

5. From third, successful run, this time considering alumina as an acid, and counting 35 weight-units of alumina the equivalent of 30 units of silica. Blast pressure: 9 to 10 ounces.

6. This is a very free-running light slag, separating easily and clean from the 45 per cent copper-matte. Thirty-six-inch furnace running at the rate of 45 tons smelting charge in 24 hours.

7. Slag from last 12 hours of run, finishing roasted ore on hand, and with shortage of limestone flux, which could not be replenished in time. Furnace not running as free as on No. 6 slag, only at the rate of 27 tons in 24 hours. As available limestone flux diminished, Slag Nos. 8 and 9 ensued, which were allowed to finish the campaign with increased fuel and blast, using up all roasted ore on hand. If continued on this slag, however, the furnace would surely have scaffolded and frozen up.

Considering the composition and behavior of all the slags given above it seems evident that in slags containing larger quantities of alumina, the alumina should be considered as an acid, replacing silica, and not as a base. It is also probable that the higher the percentage of alumina, the nearer the slag should approach a "singulo-silicaluminate," i. e., the nearer the oxygen-ratio of the bases should come to the combined oxygen of the silica and alumina and that an increase in magnesia calls for a higher percentage of bases, while absences of magnesia, and a pure limestone as a flux, will permit an approach to a "bi-silicaluminate" slag. The safe way will be to start with a "sesqui-silicaluminate" as the type of slag to be produced:

$$x(4RO.3SiO_2) + y(2RO.Al_2O_3),$$

which is approximately the slag actually made in 1881 by August Raht, while smelting very aluminous and very limey ores from the Horn silver mine.

Having had forced upon me the conviction of the acid character of Al_2O_3 in the artificial silicates, or at least in some of them, it has engendered some doubt whether alumina always has that function of a base in the natural silicate minerals, assigned to it in the orthodox formulas of silicates.

Table III

Analyses of Nelson, N. Z., Slags

	Slag 1.	Oxygen percentage.	2	O	3	O	4	O	5	O
SiO_2	36.4	19.4	34.6	18.4	39.1	21.3	21.8	11.6	18.4	9.8
Al_2O_3	27.8	13.1	26.4	12.4	22.9	10.8	31.8	14.7	20.8	9.8
FeO	14.2	3.1	32.2	7.2	28.6	6.4	30.6	6.8	35.9	7.9
Ca	1.5	0.4	....	....	....	....	....	....	10.0	2.9
MgO	18.4	7.4	6.8	2.7	8.4	3.3	15.5	6.2	14.3	5.7
Oxygen ratio, slags 1 to 5.										
Al basic:	19.4:20.4; 0.95		18.4:22.3; 0.83		21.3:20.5; 1.05		11.6:27.7; 0.42		9.8:26.3; 0.37	
Al acid:	32.5:10.9; 2.98		30.6:9.9; 3.09		92.1: 9.7; 3.32		26.8:13.0; 2.02		19.6:16.5; 1.19	

	6	O	7	O	8	O	9	O
SiO_2	19.7	10.5	22.6	12.0	24.2	12.9	23.9	12.7
Al_2O_3	18.5	8.7	22.5	10.6	26.2	12.3	26.8	12.6
FeO	28.5	6.3	32.7	7.3	32.1	7.1	33.5	7.4
CaO	15.0	4.3	5.1	1.4	8.0	2.3	6.4	1.8
MgO	18.3	7.3	18.4	7.4	9.2	3.7	9.4	3.8
Oxygen ratio, slags 6 to 9.								
Al basic:	10.5:26.6; 0.40		12.0:27.8; 0.43		12.9:25.4; 0.51		12.7:26.6; 0.50	
Al acid:	19.2:17.2; 1.07		22.6:15.2; 1.49		25.2:13.1; 1.92		25.3:13.0; 1.95	

Table II

Analyses of Horn Silver Slags

	Slag 1.	Oxygen† percentage.	Slag 2.	Oxygen† percentage.	Average of 1 and 2.	Oxygen.
SiO_2	33.9	18.1	35.0	18.7	34.50	18.40
FeO	26.8	6.0	25.4	5.7	26.10	5.80
CaO	26.1	7.5	24.9	7.1	25.50	7.30
BaO	3.2*	0.3	3.2	0.3	3.20	0.30
Al_2O_3	10.8	5.1	9.3	4.4	10.05	4.75
	100.8	37.0	97.8	36.2	.....	.....

*Not determined in this analysis. †Not given in Mr. Eiler's paper.

Oxygen ration, Al as base.

1 O in acid: O in base::18.1:18.9::0.96:1
2 O in acid: O in base::18.7:17.5::1.06:1
Average: 18.4:18.15 = 1.01:1

Oxygen ratio, Al as acid.

1 O in acid: O in base::23.2:13.8::1.68:1
2 O in acid: O in base::23.1:13.5::1.76:1
Average: 23.15:13.4 = 1.73:1

By assigning to alumina the role of a base, Mr. Eiler deduces the formula $3FeO.2SiO_2 + 4CaO.2SiO_2$.

The Phenomenon of Grain Growth

The Author Defines Germinative Temperature, a New Term Peculiarly Applicable to the Discussion of the Complex Changes Taking Place in Metals —The Causes of Grain Growth Are Enumerated

BY HENRY M. HOWE

IN general when the temperature of metal is raised progressively, a given set of grains which undergo no growth in the cold will start to grow on reaching a certain temperature, and will continue to grow at all higher temperatures.

The germinative temperature is defined as that at which growth begins. We have then an inert temperature range below the germinative temperature, and a growth range above it, the germinative temperature being the limit between these two ranges. So, too, a germinant grain is one which is at its germinative temperature, and hence beginning to grow, while inert grains are those below their own germinative temperature, and the term "growing grains" includes those which are germinant and those which are above their germinative temperature.

When only a limited part of the metal is at its germinative temperature, this becomes a fast-growth temperature, because the germinant grains feed unopposed on the inert ones against which they abut.

Does Germinance Depend on Time?

The late results of White and Wood, to be published in Vol. XVI of the *Proceedings of the American Society for Testing Materials*, tend to complicate our ideas, for they indicate that germinance depends not alone on temperature but also on time, so that germination may occur on a long exposure to a temperature at which none can be detected after a shorter exposure. This indeed agrees better with our general knowledge of aging. In this view inertness is not absolute but only relative.

Grain growth, that is the absorption of certain grains by certain others, is favored, and the germinative temperature is consequently lowered, by grain fineness, by grain-size contrast, and by prior plastic deformation.

Grain fineness favors grain growth because it implies extensive grain boundary surface at which alone can absorption occur. To vary the angle slightly, a growth which doubles the size of extremely fine grains means only that each alternate very fine grain absorbs its adjoining still smaller neighbor, a much faster process than the absorption of one enormous grain by its even greater neighbor, faster whether we hold that the whole of a given grain is absorbed simultaneously, or, as it seems more probable that the swallowing is gradual, as for instance by some kind of boundary migration.

Grain-size contrast, that is the difference in size between adjoining grains, favors grain growth because the absorptive and the resistant powers of a grain increase with its size, so that, when there is great grain-size contrast, growth is favored jointly by the great absorptive power of the larger grains and by the weak resistance of the smaller ones.

Plastic deformation or overstrain favors grain growth, perhaps by leading to fineness of grain and to grain-size contrast. The fact that the germinative temperature is the lower the greater the deformation has been tallies with the former explanation, because increasing deformation would naturally lead to finer grain size. It may also increase the grain-size contrast. But the fact that grain growth will not occur at all unless there has been plastic deformation suggests that some additional cause applies here.

Grain growth occurs the more readily the higher the temperature, and the greater consequently the mobility. It is opposed, and consequently the germinative temperature is raised by obstructions, such as cementite, slag and other sonims in iron, and thorium oxide in tungsten; and by grain-size equalization, or the decrease of grain-size contrast.

The rate of growth increases with the difference in absorptive power between adjoining grains, whether this is due to a difference in their temperature; or in their size, that is to grain-size contrast; or in the prior plastic deformation. It further increases with the temperature and with the initial grain fineness. The rate of growth decreases as the grain-size increases, because this increase implies a corresponding decrease in the extent of grain boundary surface. The fastest growth seems due to temperature.

Grain growth may be divided into the normal and the exaggerated. In most industrial heatings there is normal grain growth, that is to say a coarsening which is leisurely unless the temperature approaches the melting point. In strong contrast to this is the exaggerated growth noted by Stead, Carpenter, Sauveur and others, which may be extremely rapid and may lead to extreme coarseness.

If we leave out of consideration temperatures approaching the melting point, exaggerated grain growth seems to occur only at the contact of germinant and inert grains.

Effect in Wire Drawing

Wire-drawers have found that although annealing often causes marked coarsening after the slight deformation of the wire-straightening process, it does not alter the extreme deformation of industrial wire-drawing. Here we may suppose that, after wire-drawing, the temperature is so low that in the early stages of the heating it is passed through too rapidly to permit appreciable grain growth at this relatively low temperature, whereas after the slight deformation of straightening, the germinative temperature may well lie at the relatively high temperature of annealing, at which first the sojourn is long, and second the rapidity of growth is relatively great. The reason why extremely slight deformations do not lead to coarsening on annealing is that the position of the germinative temperature which they determine is so high that it is not reached in annealing, if indeed it does not approach closely the melting point of the metal.

I suggest the obstructing effect of foreign bodies as a possible explanation of one set of cases in which coarsening is lacking, a set illustrated by Professor Sauveur's finding that marked coarsening does not occur unless the carbon content is between 0.04 and 0.12, and that it occurs most readily when the carbon content is between 0.05 and 0.07 per cent.

The presence of 0.12 per cent car-

An abstract of a paper to be presented at the New York meeting of the American Institute of Mining Engineers, February, 1917.

bon, implying that of 13 per cent pearlite, might well offer enough mechanical obstruction to prevent coarsening, for each pearlite mass would act as a wholly foreign body to bar the union of the two grains between which it lies. Even as little as 0.07 per cent carbon, implying the presence of about 8 per cent pearlite, might have an important obstructive effect. On the other hand, when the carbon content is less than 0.04 or 0.05 per cent, there may well be enough iron oxide or minute gas bubbles to offer serious obstruction. Here we should remember Benedicks' discovery that although the specific volume of his steels was strictly proportional to the carbon content between the limits of 0.45 and 1.20 per cent, that of his iron with 0.08 per cent carbon and 0.03 per cent silicon was abnormally great. This last was wrought iron, and hence its specific volume would be made abnormally great by the presence of slag. But with only 0.03 per cent silicon the slag content should be extremely small, probably not more than 0.20 per cent, and therefore insufficient to fully explain the surprisingly small density.

This brings us to a hitherto unsuspected element of fitness of iron for man's needs. The coarsening of its ferrite is limited to temperatures so far below the melting point as to give great viscosity, and hence to restrict the coarsening tendency. On rising past *Ac*1, the 8 per cent pearlite which we have just considered turns into 8 per cent austenite, and this increases very rapidly in quantity, till at *Ac*3 it forms the whole As it increases in quantity it forms a more and more complete obstacle to the coarsening of the ferrite with which it is now associated, so that in fact the coarsening of ferrite, even in lower-carbon steels, is probably confined to temperatures below 800 degrees Cent., and thus many hundred degrees below the solidus, and therefore corresponding to great viscosity.

Moreover, we may suspect that at *Ac*2 the change from alpha to beta ferrite, which Burgess and Scott, in their exceptionally important paper in Comptes Rendus, vol. 163, p. 10, July 10, 1916, seem now to have established clearly, will break up any coarsening which has occurred in the alpha ferrite below this temperature. This, if true, would confine the coarsening range to below 768 degrees Cent. These considerations lead one to expect to find iron less subject to coarsening than most metals.

THE adaptability of the bessemer process to a constantly increasing variety of work has resulted in a tremendous growth in the number of converter steel foundries in the United States. Business opportunities in this branch of the steel industry have constantly increased, and some converter foundries rank with the foremost jobbing plants in capacity and in variety of the work that is performed. The converter steel foundry of the Otis Steel Co., at its Lakeside plant, Cleveland, is typical of casting plants of this character. The main building is 118 x 125 feet, of which 118 x 57 feet is devoted to molding and casting floors; 35 x 68 feet to the core room and core ovens; 46 x 68 feet to the cupola, converter, blowers and supply bins; and 46 x 68 feet to the grinding and cleaning department.

The melting department consists of a Tropenas outfit—a cupola with a melting capacity of eight tons per hour and a converter with a capacity of two tons per blow. The converter is tilted by an electric motor controled from a pulpit commanding a good view of the blow.

The air for the cupola and converter is provided by blowers of the Root's type. A No. 4 blower, direct-driven by a 15-horsepower General Electric motor at 1,150 revolutions per minute, supplies low pressure air for the cupola. A No. 5 blower, direct-driven by a 75-horsepower General Electric motor at 950 revolutions per minute, furnishes air at from 4.25 to 4.50 pounds for the converter.

The melting units are arranged for convenient handling of the metal. The cupola is located next to the converter, thus reducing the distance the molten iron must be carried for charging into the steel-making vessel. The metal is handled by a 5-ton Whiting overhead traveling crane, which also serves the casting and molding floors. The relative positions of the cupola and converter are shown in the illustration on this page, which also gives a view of the casting floor with molds in the foreground. The converter and cupola are shown on page 373. The large concrete-lined pit beneath the converter receives the slag.

Low phosphorus pig iron and low phosphorus scrap exclusively are

used for melting. The scrap consists of plate ends and shearings from the company's plate mill. The metal mixture contains about 50 per cent pig iron and 50 per cent steel scrap, while the coke required for melting usually runs about 300 pounds per ton of charge. An average analysis of the cupola metal shows 3 per cent carbon, 0.65 manganese, 1.75 silicon, and phosphorus and sulphur less than 0.04 per cent each. In most of the miscellaneous work turned out, 0.25 per cent carbon steel is used, but castings are also made to meet a variety of requirements from 0.15 to 0.50 per cent carbon.

The converter blow lasts from 13 to 25 minutes, and recarburization is effected in the vessel with 80 per cent ferro-manganese. Fifty per cent ferro-silicon in the requisite amount is added in the ladle to bring up the percentage of silicon.

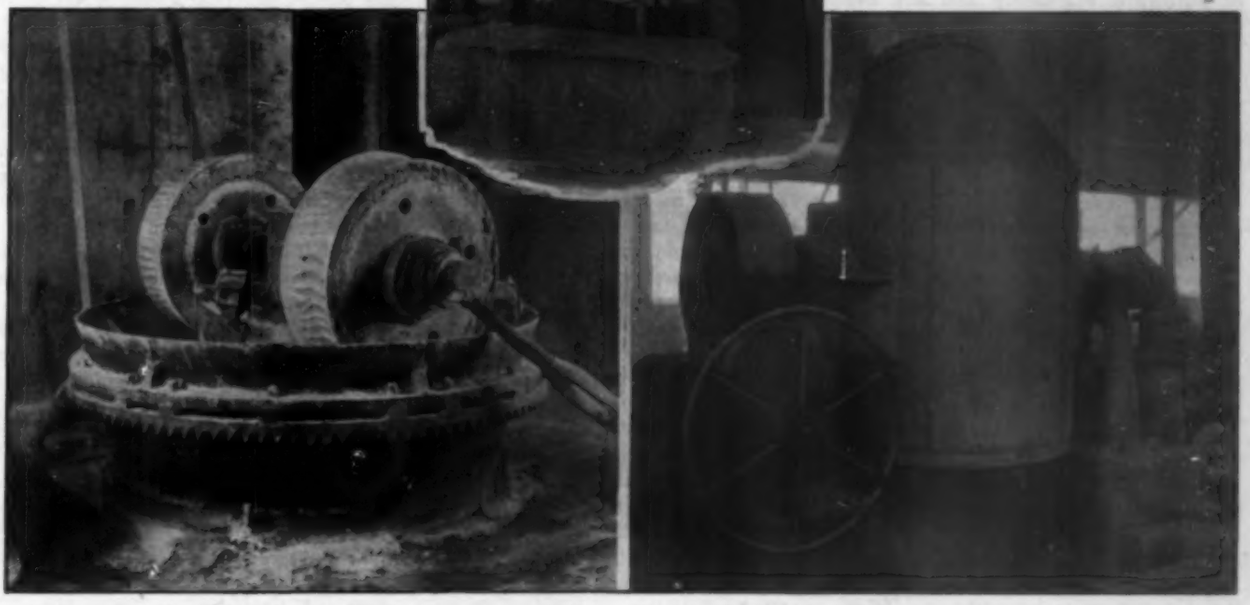
Melting and pouring is done every other day, and with the equipment mentioned, the foundry pours up to 240 tons of steel a month. Chemical, metallurgical and physical tests are made at the laboratory of the Otis Steel Co. to assist the foundry in maintaining a high standard of product.

Snap-Flask Molding

Snap-flask molding is employed extensively, and the snap molds are made up on the floor, on benches, and on molding machines. The snap flasks range from the usual small sizes up to 5 feet in length. After being rammed, the molds are loaded onto frames on trucks and are wheeled into the drying ovens. The snap molding department is provided with four coke-fired mold-drying ovens, each of which will accommodate two trucks. The trucks are loaded to maximum capacity, and only the space required for the circulation of heat between the molds remains unfilled. As shown at the top of this page, the truck in the foreground has low platforms.

Material Storage

The sand storage is in a 35 x 100-foot building adjoining the main foundry. The sand bins have a capacity of about 1,000 tons or sufficient sand to last through the winter. Coke, pig iron, and scrap are stored in covered bins in the foundry yard surrounding the main building. These materials are elevated to the charging floor by means of an outside elevator. The sand is conveyed to the foundry room in buckets handled by a monorail telpher of 5-ton capacity, built by the



VIEWS IN CONVERTER STEEL FOUNDRY OF OTIS STEEL CO.

Euclid Crane & Hoist Co., Euclid, O.

At present, chipping, grinding and cleaning are done in a section within the main foundry building. The castings are freed from adhering sprues, gates, risers, etc., by means of an oxy-acetylene torch of the Davis-Bournonville type. Cracked, checked and otherwise defective castings are scrapped. In general, the castings are first cleaned by chippers using hammers made by the Cleveland Pneumatic Tool Co., Cleveland. A double grinding stand is used for grinding small castings which can be handled readily, while a swing-arm grinder is employed for large castings. The grinding stand is individually motor-driven by a 5-horsepower motor and is provided with exhaust hoods of modern design.

A new building of brick and steel construction, 67 x 120 feet in size, is now being built. On completion of this building, the grinding and chipping department will be moved to it. The molding capacity of the foundry will thus be increased by an area of 46 x 68 feet, now occupied by the cleaning department, making a total area of 9,854 square feet for the molding and casting floor. The total grinding and cleaning space available when the new building is completed will be 8,040 square feet. Sand blast apparatus, tumbling barrels, grinders, and chipping equipment are all on hand and will be installed in this building. This will permit the cleaning of castings in a separate building, thereby eliminating dust and noise from the main foundry. Annealing furnaces have also been provided, and these will be installed in the new cleaning building. Steel castings made in this foundry range in size from a few ounces to approximately 100 pounds and consist of gears, pinions, crane castings, railway locomotive, automobile and general machine castings. Chippers, melters, grinders, and all employes handling molten metal wear safety goggles of an approved type. All buildings are well lighted and ventilated. A wash and dressing room, including lockers, lavatory and showers, is located in a separate room, on the second story adjoining the charging floor. Access to this wash room is had by means of a stairway from the molding floor. The location of the room in this place conserves space and allows the entire ground floor to be used for operating purposes.

Training Journeymen for the Future

W. B. HUNTER, director of the industrial department of the Fitchburg high school, speaking to the New England Foundrymen's Association during its recent meeting in Boston, stated that the unprecedented demand for all kinds of labor brings the question of training the youths of America for the iron and steel trades to the foreground. Mr. Hunter pointed out that the apprenticeship system which has given us such a host of skilled mechanics in every trade has received scant attention on the part of present-day employers. He believes the boy of today receives little inducement to enter the trade because the introduction of automatic machinery and the use of unskilled labor to operate it has created the impression, both within and without the shop, that skilled labor no longer was necessary or desired. Many employers also look upon the matter of training apprentices in an unfavorable light for in many cases, experience has proved that after an employer spends a great deal of time and effort to train a man, he leaves to enter the services of a competitor. Another reason for this lethargy is that the young men of modern times seem to prefer the more refined life indicated by the presence of a white collar.

The development of our modern industrial structure, according to the speaker, is responsible for the abatement of the intimate relationship which formerly existed between an employer and his employes. "Backbones are turned to wishbones, wishing for lighter tasks with more pay, and many who might have made good mechanics were influenced by the external appearance of prosperity." Such were the conditions, when 20 or 30 years ago the idea of the trade school first was introduced. The first step was manual training which was followed by the school that gathered a large group of boys under one roof and taught them by a series of exercises the principles of metal and wood working and foundry practice. About this same time, the shops were experiencing difficulty in securing men and began to establish their own trade schools, teaching their employes the elements of drawing and shop arithmetic. These earlier efforts led to the present agitation for industrial education on a broad basis that would train journeymen efficiently and in sufficient numbers to cope with the demand for skilled workmen.

Mr. Hunter pointed out that he felt that the public school is the logical agent to train the young men to become journeymen which are so necessary in the modern industrial world. To his mind, two forms of industrial education stand out prominently because of their practical and simple nature and because of the low cost of installation and operation. They are, namely, the co-operative and the continuation plans. The co-operative plan is well known, having been established at the University of Cincinnati some years ago. By this plan the apprentices spend part of their time alternately in the school and in the shop. Shop rules and hours obtain while they are at work. In school they are taught drawing, English, mathematics and similar subjects which pertain to the particular branch of trade for which they are training themselves. This course extends through a four-year period, the first year being spent wholly in school and the next three years being spent partially in the shop and the school. The student devotes his entire time to studies.

In the continuation plan, those who are already at work are given two to four hours a week for school that they may acquire greater efficiency in drawing and mathematics and such subjects as are closely allied to the job on which they are working. In this case, however, the time is so restricted that only a small amount of progress can be expected. It is, however, a step forward and has proved practical where it has been tried.

There are three plans prominently before you. In Massachusetts, the state sponsors the trade school idea, which supplies its building, provides it with instructors and machinery and works out the program of subjects where the boys spend from two to four hours a day at the school, thereby withdrawing them from productive labor. By the continuation plan, you arrange your schedule so as to allow your help to be absent from the shop one or two mornings a week. By the co-operative plan, the school boy, the boy you want, the boy with brains, is brought into the work shop. Your machines are manned, the boy is paid and at the same time receives a broad, theoretical training along the lines of shop work. The results of the co-operative course have amply justified the confidence and expectations of its sponsors and deserves the consideration of every employer.

Purchased Power for Steel Mills

Steel Mill Engineers Are Looking Upon Central Station Power for Mill Drives With Increasing Favor—Some of the Reasons for This Are Pointed Out in the Following Article

ONE of the most valuable of the papers presented before the Association of Iron and Steel Electrical Engineers at its tenth annual convention was the report on "Central Station Power for Steel Mills", by the central station power committee. The authors of the paper point out that the problem is primarily an economical one which involves a study of the conditions of operation in order to compare steam or other forms of drives with electrical drives using central station power. If central station power is to be selected, the rates must be sufficiently low to be attractive. This does not signify, however, that the rate need be lower than the cost at which power can be generated at the steel plant.

A large steel plant can generate its power more cheaply than a small plant and for the same reason, the central station of a capacity several times that required for the steel mill can produce power more economically than the mill plant. Where there is a large surplus of waste gases, however, it is hard to conceive that purchased power may be obtained at a lower rate than that at which it can be produced. This refers especially to the larger steel plants, but there are a number of plants which require a comparatively small amount of power and also a number of plants which receive raw material in the form of billets or ingots and consequently do not have any stacks from which waste gas may be obtained. It is in these two classes of plants that careful consideration should be given to the economies and advantages derived from purchased central station power.

Low Cost of Central Station Power

The sole object of the central station is the manufacture of power—continuity of service at a low rate. The load factor is a very important item and has a direct bearing on the cost at which power may be produced. The load factor of steel mills is considered highly desirable and when equalizing devices are employed, the objectionable momentary peaks may be considered as having no detrimental effects. Granting, therefore, that the power for a steel mill may be purchased from a central station at an attractive figure, there are many other advantages which are worthy of consideration. All worry and care of an isolated plant is removed from the management of the mill and the entire time of the superintendent and electrical engineer may be devoted to the care and application of the motor equipment. Other advantages include the freedom of capital which would otherwise be invested in equipment and also the ability to secure additional power without costly extensions to the generating equipment.

An analysis of the cost of generating power at a private plant in a steel mill must be made by computing the cost of each fractional part of the power unit. The difficulty of accurately computing this cost of power in such plants is caused by the interrelation of the power department with other departments, and, as a rule, the generating units usually bear more than their just proportions in the distribution of the expense. Therefore, unusual care should be exercised in estimating the relative costs of central station power and private plant power before a comparison is made.

In considering the substitution of purchased power for private plant power, it is necessary to know as much as possible about the electrical load of the plant over a period of from one to three years, including total kilowatt-hours by months; graphic totalizing watt-hour records for typical days or months; load factor conditions, etc. In plants having modern totalizing watt-hour meters it is not expensive to install printing devices to procure load curves exactly as with central station metering. This method leaves none of the cost determining conditions for purchased power to be assumed and consequently insures dependable cost estimates. The central stations will be found more than willing to cooperate with the steel companies in determining the characteristics of the load, and in many cases they may be able to furnish and install the instruments required for the load record.

Knowing the cost per kilowatt-hour of the proposed purchased power, and the same for private plant power, it is easy to decide on the most advantageous product.

The advantage of central station power from the cost standpoint will depend on the following points:

1.—The ability to get a suitable power contract from the power company adapted to the peculiar requirements of a steel mill load.

2.—The class of power generating equipment of the steel mill, whether modern or very old and obsolete.

3.—The character of the steel mill business. Whether there is available blast furnace gas and waste heat in excess of that required for pre-heating and steam generation for purposes other than power, that might be used for steam generation to produce power.

4.—The willingness of the steel mill management to change their present methods of using blast furnace gas and substitute the gas fuel for coal used for pre-heating, soaking pits, etc.

5.—Whether the steel mill load is subject to wide seasonable and market demand fluctuations. With central station power the cost varies more nearly proportional to the mill production.

6.—The cost of power is definitely fixed by contract and schedules are filed with public service commissions, the tendency being to regularly decrease the rates as the business of the central station grows. The steel mill load usually representing high load-factor business, makes it very desirable central station business and offers the logical field for lowest industrial power rates.

Rate Schedules

The rate schedules of 22 power companies furnishing power to steel mills have been obtained, and to permit comparisons the net resultant rate for 1,000-kilowatt and 5,000-kilowatt loads at 50 per cent load factor were calculated, giving the following results:

NET RATES PER KW.-HR. 50 PER CENT LOAD FACTOR

Demand.	Maximum.	Minimum.	Average.
1,000-kw.	1.246c	0.700c	0.9417c
5,000-kw.	1.060c	0.667c	0.8464c

The divisions according to frequency are as follows:

60 cycles	10
25 cycles	9
25 or 60 cycles	3

The power factor required, if any, is specified. It varies from 60 to 90 per cent. Eight out of a total of 11 require 80 to 90 per cent, three 60 to 75 per cent, and 11 make no reference to power factor. It is noticeable, however, that the average rate of those having power factors specified are lower than those which ignore power factor.

The forms of rate schedules are

many and vary from flat rates per horsepower year, regardless of energy consumption, to those having complicated demand and energy rates and more complicated discounts. The majority of the schedules, however, have separate demand and energy charges, each of which may be in from one to six steps. For demand systems of charging, the peak period varies from one minute to 60 minutes, some are integrated peaks, some sustained peaks, while others do not state how the peak shall be determined.

Load factor and power factor play such important parts in the cost of manufacturing and distributing electric service, that minimum power costs cannot be obtained without taking these two factors into the calculations. The demand, including the effect of power factor upon it, is just as important a part of a proper rate schedule as is the energy charge. A mill, with a load factor of 70 per cent and a power factor of 80 per cent or better, can be served at very much lower cost than another mill having a load factor of 35 per cent and a power factor of 50 per cent to 70 per cent, and should not be required to pay an average rate that would be penalizing the mill with a good load for the sins of the mill having a poor load condition.

Rate schedules should be as simple as possible and complicated systems of rates and discounts for varied load factors and consumption should be avoided. Where the mill can so adjust its operations to eliminate the central station peak, there should be a lower rate than for peak service. Some of the power companies reporting, charge only 50 per cent of the peak demand rates for off peak service only.

While the difference in operating costs of the power companies will not permit of uniform rates for all, their costs all follow the same general lines and with different figures, fit different conditions. Standard forms of rate schedules and contracts could easily be made to cover all companies. To this end we would recommend that in negotiations for central station power service and in order to obtain the most favorable rates to the purchaser, it be insisted that the rate schedule be divided into demand charges and energy charges; that the demand be the average or integrated peak of 15 to 30 minutes duration; that the power factor be 80 per cent with decrease or increase in the demand to be charged for accordingly as the power factor is above or below 80 per cent; that the demand charges per kilowatt be in two or more steps; that the energy charges per kilowatt-hour be in two or more steps; that any excess demand occurring at other than the peak period of the power company's plant be charged at only one-half the demand charge normally applying for such excess if occurring on the power company's peak period. Long-worded contracts should be avoided in favor of short precise statements of what is to be furnished, how it is to be measured and what is to be paid, with no doubt as to what is expected of each party.

With rate schedules on the basis recommended, the mill engineer will obtain the benefits due to good operating conditions and not be obliged to pay for the poor conditions of another consumer's load.

The electric drive lends itself admirably to a close analysis of operating conditions. The various types of indicating, recording and graphic meters enable the user of electric power to accurately determine the distribution of power costs, while, in the case of other forms of power, the distribution is arrived at largely by arbitrary methods. The use of such instruments also enables the user of electric power to collect engineering data such as capacity of machines, load curves, power requirements, maximum demands, power consumption and, in addition, provide a means of analyzing the cycles of operation throughout the plant.

With such records, the central station can accurately determine the requirements of steel mills and negotiations for the sale of power are greatly facilitated.

The curves shown in the accompanying illustration have been compiled from data secured from motor-driven mills and cover a period of two years. These curves are self-explanatory and illustrate the analytical possibilities of motor drive.

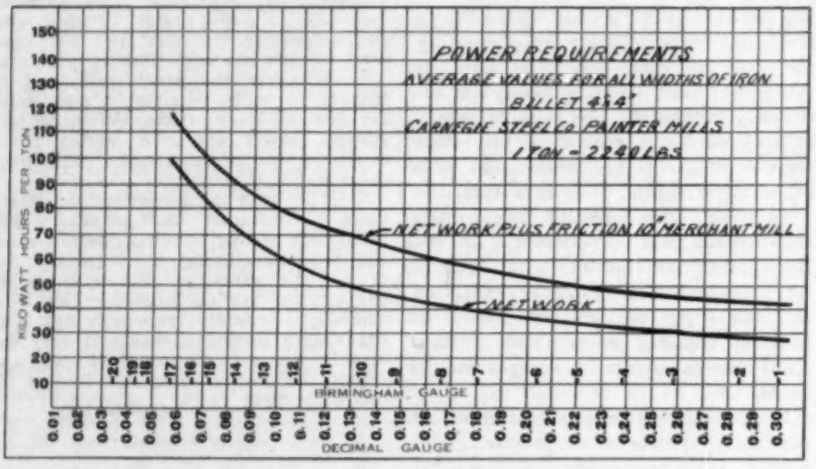
The use of purchased power by steel companies is rapidly increasing, the total being more than 300,000,000 kilowatt-hours per year. During the last two years approximately 50 per cent of the motor units applied to main rolls were connected to central station companies' lines, and the percentage of power used by them as compared with power for the total of motors on main rolls has increased from 12 to 18 per cent.

The number of companies using purchased power and the long period of many of the contracts is a strong recommendation, particularly from the standpoint of reliability. The power rate is favorable as compared with the cost of generating power, in a large majority of industrial plants. The use of purchased power often facilitates the completion of improvements, especially in the case of the remodeling of a plant, eliminates the extra supervision and care of a power station, and is a material factor in reducing first cost.

In all large modern central stations the power is generated as alternating-current at a voltage considerably higher than is permissible for use around a plant. To transmit this power over long distances the generated voltage is further raised to several times its initial value for the purpose of keeping down the transmission losses and investment charges.

At the receiving end of the transmission line this power must be retransformed to at least two and generally three lower alternating-current voltages, namely: 6,600 or 2,200, 440 or 220 and 110, and where direct-current power is used further transformation is required from alternating current to direct current. For rotaries a different alternating-current voltage from those given above is required in order to get the proper direct-current voltage.

The 6,600-volt or 2,200-volt system is used for driving the synchronous



POWER REQUIREMENTS FOR ROLLING 4 x 4-INCH BILLETS

motor of the motor-generator sets, the large motors driving the mills and some of the larger auxiliaries, say from 100-horsepower up for the 6,600-volt and 50-horsepower up for 2,200-volt for driving pumps, fans, blowers, etc., in those locations where these voltages can be used without endangering life and property.

For the remaining auxiliaries the alternating-current voltage is further reduced to 440 or 220 volts. Motors wound for these voltages have a wide range of application covering almost all classes of service in the mill especially where constant speed characteristics are required.

For lighting 110-volt is generally used and transformed from either of the above voltages. Now in all of the above transformations a certain percentage of the initial purchased power is lost, the magnitude of the losses being in the order of the motor-generator sets first, the rotary converter second, and transformers third and least.

In some contracts for central station power, the power paid for is that which is delivered to the high tension side of the transformers connected to the transmission lines, the power being measured on the low side of the transformers, the wattmeter readings on the low side being multiplied by a constant or multiplier which takes into account the transformer losses. In contracts of this class the purchaser pays for transformation losses. In other contracts the power paid for is that which is delivered on the low side of the stepdown transformers, the power company paying the losses of the first transformation, the purchaser paying for all of the other changes.

Generally it is not feasible to carry the high-tension transmission line voltage very far into the plant, so it is customary to install a transforming station on the edge of the plant and stepdown the line voltage to, say, 6,600 or 2,200 and transmit it to the various feeder stations in the plant either overhead or underground, the latter being preferable. This then brings in another loss, a transmission loss in addition to the transformer loss.

The first losses occur in the transforming station and may vary from 2 to 3 per cent, say 2.5 per cent. This leaves 97.5 per cent of the power to transmit to the feeder station. The transmission losses will be from 5 to 10 per cent, say 7.5 per cent; this will leave 90.2 per cent of the original power delivered to the feeder station. Here it is split up, part of it may go direct to the mills to drive the main rolls at the voltage at which it is received at the feeder station, namely 6,600 or 2,200 volts; some of the remaining power is further transformed to 440 or 220 volts for use in the induction or synchronous auxiliary alternating-current drives. This will entail another 2.5 per cent loss, making available for these auxiliaries 87.9 per cent of the power originally delivered for them. Another 3 per cent will have to be deducted for that part which is transformed from 440 to 110 volts for lighting, leaving a net available of 85.3 per cent of the 100 per cent set aside for lighting. The question may be asked why not transform from 2,200 to 110 rather than from 440 to 110, and save the 3 per cent loss. The reason is that all mills do not have 2,200 volts, but do have the 440 volts, and it is much safer carrying the 440 volts around than 2,200. The balance of the power is to be converted into direct-current either by rotary converter or motor-generator set.

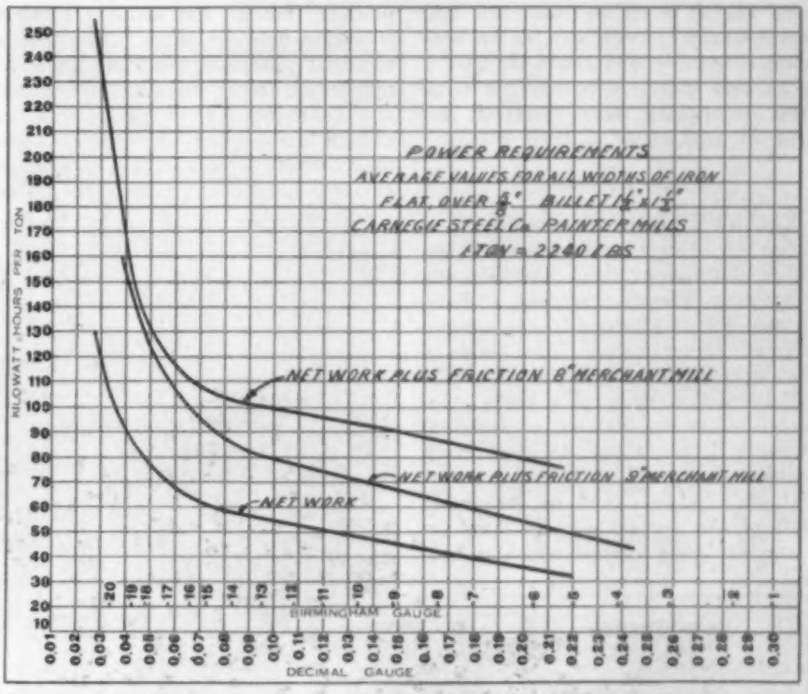
If rotaries are used about 3 per cent will be lost in transformers supplying the rotaries, and 5 per cent in the rotary itself, leaving a net power delivered to the direct-current bus bars of 83.1 per cent of the original, for use by the rotaries. If motor-generator sets are used the losses of transformation will be about 12 per cent, leaving a net power delivered to the bus bars of 79.4 per cent of the original power for the motor-generator sets.

A study of the losses would indicate that in deciding on the motor equipment that that equipment should be selected which would entail the least losses to the power delivered to the motors. If this was followed out, without regard to other conditions, we would select 6,600 or 2,200 volt apparatus, but there are physical limitations and considerations of safety that limit the use of high voltages, consequently only a relatively small number of the total motor equipment can use them.

Our next choice so far as efficiency goes, would be the 440 or 220-volt alternating-current for auxiliaries. These can be used in almost all applications where direct-current power is used, the exceptions being where variable speed and dynamic braking are required. The direct-current motors are so much better adapted for this class of service that the disadvantage of greater conversion loss is more than compensated for by their flexibility and adaptability to varying operating conditions.

The ratio of alternating-current to direct-current used will vary greatly in different plants, depending on so many factors that no standard can be set.

In general, in those plants where power is purchased and where there are a large number of cranes and variable speed drives, it is safe to say direct current will predominate for auxiliaries probably in the ratio of 60 per cent direct current to 40 per cent alternating current, for voltages


POWER REQUIREMENTS
AVERAGE VALUES FOR ALL WORKS OF IRON
FLAT OVER 8" BILLET 6"x6"
CARNEGIE STEEL Co. PAINTER MILLS
1 TON = 2240 LBS
NET WORK PLUS FRICTION 8" MERCHANT MILL
NET WORK PLUS FRICTION 9" MERCHANT MILL
NET WORK
KILOWATT HOURS PER TON
BIRMINGHAM GAUGE
DECIMAL GAUGE

GRAPHIC ANALYSES OF MILL DRIVE POWER REQUIREMENTS

of 440 alternating current or less and 250 direct current.

The alternating current is suitable for driving fans, pumps, hot saws, cold saws, conveyors, straighteners, drill presses and possibly some mill tables. The writer does not favor alternating-current motors for table drives, for the majority of them require a wound rotor type of motor which, as a rule, is more difficult to repair than a direct-current armature and the direct current is better adapted to heavy table work. The direct current will be used for cranes, tables, charging storage batteries, electrolytic work and variable speed motors, especially those used for driving machine tools.

A Safe Substitute for the Third Rail

WHAT is probably the most recent device designed to transmit current to electric locomotives and trucks, producing in effect the same result obtained by means of an overhead trolley or third rail, has been introduced by the Simplex Surface Contact Co., Williamsport, Pa. It is claimed that this system operates successfully in an economical manner, and above all, that it is entirely safe. A number of large steel companies have installed this type of equipment in their plants.

Track Equipment

The track equipment consists of a series of contact switch boxes, bolted to the ties at fixed intervals and containing gravity switches. Each contact box is attached to the conduit covered feeder cable. The body of the contact box, that is the side walls and bottom, is made of a heavy reinforced insulating material of sufficient strength, it is claimed, to meet every requirement of industrial and commercial use. At one end of the inside wall of the contact box is fitted an extra insulation against which is held

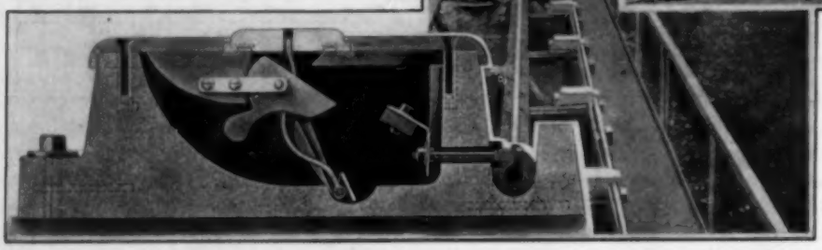


FIG. 1—CROSS-SECTION OF CONTACT BOX

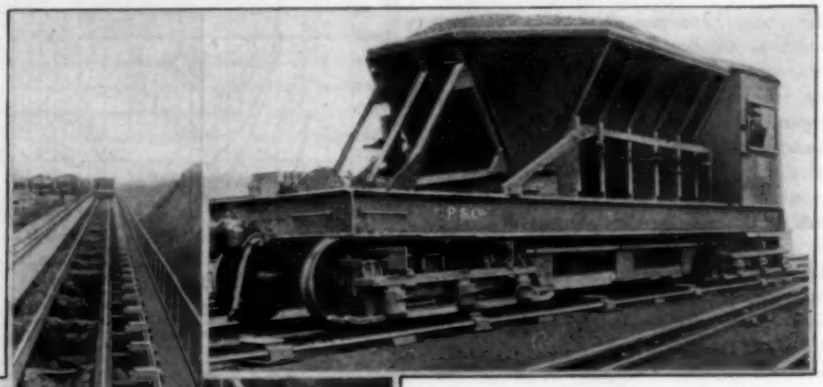


FIG. 2—CONTACT SYSTEM ON ORE TRESTLE

a brass brush-holder with a carbon contact surface, as indicated in Fig. 1. A bronze stud running through the end wall connects the brass brush-holder to the feeder cable lying in the outside trough. When the connections in the troughs of the contact boxes are insulated, the only live points on the system are the carbon brushes inside the contact boxes. The balance of the mechanism is attached to the lid as shown in Fig. 1.

The lid of the contact box is made in three sections, the ends of iron and the center section of brass, so fitted together as to constitute one solid piece. The under side of one iron section terminates in a concave surface which serves as an actuating magnetic pole piece, while the under side of the other terminates in a flat surface, which serves as a retaining magnetic pole. These poles carry magnetism from the magnets on the locomotives through the armature which is swung between them. This armature has side and top contours corresponding to the magnetic pole-pieces and is suspended between them in such a manner as to revolve under their magnetic influence. A break of three-sixteenths of an inch exists between the face of the armature and the face of the pole-pieces, thus allowing the armature free action on the pivots supporting it.

The center of gravity of the armature lies between its pivots and the end of the contact box to which the carbon brush is attached and extending in this direction is an arm carrying a copper shoe, which, when the armature revolves upward, engages the carbon brush. A flexible copper cable connects the armature shoe with the brass center section of the lid in such a manner as to allow the armature, with its arm and shoe, to revolve freely on its supporting pivots.

The armature therefore is the only movable part of the entire mechanism. As the locomotive passes over the contact box the magnets lift the armature causing it to revolve about 90 degrees, until its upward motion is checked by the contact between the copper shoe and carbon brush. The carbon brush is a live point, and energizes the armature shoe, which in turn energizes the lid through the flexible cable. Instantly, as the magnetic influence is removed, gravity acts on the eccentrically hung armature, causing the copper shoe to drop, thus de-energizing the contact box lid.

FIG. 3—MAGNETIC BARS ON LOCOMOTIVE

The lid with its mechanism is secured to the body of the contact box with four strong screws, the joint being made water-tight and dust-proof. In its operating position, the contact box is placed so that the lid is slightly above the top of the rail, allowing the collector shoe an uninterrupted sliding contact, whether on tangents, curves or cross-overs.

Locomotive Equipment

The locomotive equipment consists principally of a pair of magnetic bars on which are mounted coils to magnetize them and a single brass collector shoe suspended between the magnetic bars, as shown in Fig. 2. The magnetic bars are arranged to ride slightly above the tops of the contact boxes, but without physical contact, see Fig. 3. The collector shoe, however, is carried on adjust-

ing springs which keep it firmly pressed to the brass contact section of the lid of the contact box and at the same time automatically adjusts itself to any unevenness of track or levels of the top of the contact boxes.

The coils for energizing the magnetic bars are of standard dimensions, regardless of the length of the under-rigging, a sufficient number being used to evenly saturate the bar throughout its length. The coils are applicable for either 250 or 500 volts direct current; in the former case being connected in multiple, and in the latter two in series with the series group connected to the line in multiple. They are interchangeable and in case of damage can easily and quickly be removed. The current to these coils for magnetizing the bars is taken directly from the collector shoe.

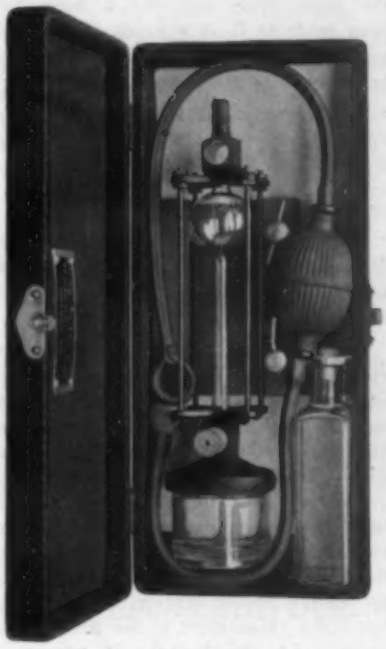
The entire under-rigging is suspended from some portion of the locomotive, which bears a constant relation to the top of the rail, thoroughly insulated from all metal parts and so placed as to allow for proper alignment with regard to the contact boxes and clearance for the magnetic bars. The suspension arrangement allows for considerable leeway, so that in case of obstruction in the track, the entire rigging can raise at least 6 inches from its normal position.

In addition to the above, the locomotive is equipped with a small four-cell starting battery, which is connected to the coils. When it is desired to cut off the line current from the locomotive, a switch in the cab may be opened, which breaks the magnetic oil circuit, thus deadening the contact boxes under the locomotive. To again connect the line current with the locomotive, the battery is used to momentarily energize the coils. This is merely a "press a button" operation to control the switch. The battery can be charged when necessary through the headlight of the locomotive.

The magnetic bars are somewhat longer than the collector shoe so the switches in the approaching boxes are closed before contact is made with the collector shoe. Conversely in passing off the box, the switches are held closed until the collector shoe leaves them, thus preventing arcing inside the boxes while the motors are in electrical contact with them.

The feeder cable is of a size to conform to the requirements of each particular operation and as applied to this system, one cable has little advantage over another. The most desirable, perhaps, is a stranded wire with a first class rubber-covered triple braid. At the point of connection in the trough of the contact boxes, the cable is stripped of 1 inch of insulation and a soldered connection is made to the stud extending through the wall of the box. This connection is afterwards thoroughly wrapped with tape and the trough filled with an insulating compound. In industrial practice the contact boxes are spaced from 8 to 15 feet apart.

For the purpose of protecting the insulation of the feeder cable, metal conduit is used for encasing the cable between the contact boxes. The ends of the conduited sections rest in the troughs of the contact boxes and are protected and insulated together with the soldered joint, by an insulating compound which is poured level with the top of the trough. The conduit is then firmly strapped to the ties.



PORTABLE CO_2 INDICATOR

The operation of the whole system is readily apparent. The locomotive moves along the track, the magnetic bars close the switches in the contact boxes directly under them. The closing of the switches energizes the lids of the boxes and the collector shoe, which makes a sliding contact with the covers of the contact boxes and transmits the current to the motors. As the magnetic bars pass off a contact box, the switch opens by gravity, thereby de-energizing the lid. As the spacing between the contact boxes is somewhat shorter than the magnetic and collector shoes, the contact box ahead is engaged before the collector shoe passes off the contact box from which it has been taking current, thus insuring an even and uninterrupted flow of current to the motors.

Pocket CO_2 Indicator

The Bacharach Industrial Instrument Co., Pittsburgh, has developed a simple and compact portable CO_2 indicator which it is placing on the market. The device, which is shown in an accompanying illustration, is said to be capable of handling about 18 analyses an hour. Tests conducted by the bureau of mines indicate that the maximum variation of an analysis is approximately 0.2 per cent. The procedure in making analyses with the portable instrument is much the same as that employed with the laboratory apparatus. The reagent is a solution of KOH in water and it is said that a large number of tests may be made with one charge of caustic. No auxiliary equipment is required to determine the percentage of CO_2 existing in a stack with the new pocket indicator.

Book Review

Pipe and the Public Welfare, by R. C. McWane; cloth; 165 pages; 5 x 7¾ inches; published by The Stirling Press and furnished by *The Iron Trade Review* for $1.00 net.

The subject discussed in "Pipe and the Public Welfare" is one of undisputed importance, as the well-being of all dwellers in cities who rely on the city for water and gas is largely dependent on good pipe. The history of pipe is traced from the days when the early Babylonians constructed it from clay to the present when New York is building a water supply system, "which is, without question, the greatest engineering feat of its kind in modern history".

The various processes through which iron passes in the manufacture of cast iron, wrought iron and steel pipe are clearly and interestingly described—the description of the manufacture of steel-making being quoted from "one of the largest producers of steel and wrought iron pipe in the United States".

As death invariably follows birth, so deterioration is the inevitable fate of all manufactured products. The effect of rust on pipe forms the subject matter of the third chapter of the book. "The Structural or Mechanical Theory of the Effect of Rust on Cast Iron and Wrought Iron and Steel", a paper written by the author in collaboration with Harry Y. Carson, and presented at the convention of the American Foundrymen's Association in 1915 is quoted in this connection. Also data on deterioration furnished by various city governments are given. Coatings for protection against rust are discussed and in this case also the testimony of various cities is instanced.

WHAT'S WHAT and WHY

Don't Ask Yourself-Ask Us!

Questions from our Readers answered by Experts

Metal Spraying Process

What is the process for spraying metal either for protective or decorative purposes? What metals may be thus sprayed and what is the cost of the work?

The original Schoop metal spray process of Europe or any such related process for the impacting of metals employs the use of a compressed air jet or other means for atomizing already molten metal; the jet of atomized metal is directed against any surface to be coated and an adherent film of metal is deposited thereon.

Both pure metals and alloys can be sprayed by this process; lead, tin, aluminum, zinc, copper, brass, bronze, German silver, and also the more rare metals are deposited as a coating from 0.001 inch upward in thickness. The cost of spraying varies with the price of the metal sprayed. The cost of spraying lead, including the cost of the metal, compressed air and labor, is from 1c to 2c per square foot.

Iron Ore Royalties

What royalties are paid per ton by lessees for ore mined in the Lake Superior region? I should like this information particularly as to the Great Northern Iron Ore Properties.

As to royalties, various plans are adopted. In many cases the royalties are determined by a sliding scale based on the price of ore at lower lake ports. Royalties in past years ranged from 13 to 20 cents and the ninth annual report of the trustees of the Great Northern Iron Ore Properties shows that the average royalty was as follows from 1907-1915: 1907, $0.1399; 1908, $0.1915; 1909, $0.1496; 1910, $0.1520; 1911, $0.1735; 1912, $0.1449; 1913, $0.1489; 1914, $0.1841; 1915, $0.1615. In recent years, however, some contracts have been made at higher royalties. For instance, the annual report above referred to states that the Mace Iron Mining Co. has been formed for the operation of the Mace mine and that a lease has been made to it at a royalty of $1 per ton. We have heard of other leases being made on a basis of $1 per ton.

Load Factor and Power Factor

Please explain what is meant by the load factor and the power factor as applied to the electric power used in a steel mill.

By the load factor is meant the ratio of the average power to the maximum power during a certain period of time. The power factor is the ratio of the electric power as given by a wattmeter to the volt-amperes. The power factor applies only to alternating current apparatus, the power factor for direct current being unity. The load factor applies to both types of service, and depends upon the adjustment of the mill operations. At the best, mill power is characterized by irregularity and high peak loads; it may range anywhere from 35 to 70 per cent. However, the mill engineer should endeavor to make a layout that will require as even a consumption of power as possible, so as to reduce the cost of the equipment and of power to a minimum. The power factor results from the current lagging behind the voltage owing to the induction in alternating current apparatus. The current may also lead the voltage, but in mill work the lag is expected. The power factor may range from 50 to nearly 100 per cent. Possibly from 65 to 70 per cent is the best that can be expected. Theoretically, the power factor is the cosine of the angle of lag. Thus, for a lag of 45 degrees, the cosine is 0.7, and the power factor 70 per cent. It would pay to have careful tests made of any installation, as an analysis of the data may lead to ways and means for a considerable economy in power.

Methods of Making Steel

Please compare the production of bessemer and open-hearth steel in the United States so as to show how and when the open-hearth process first exceeded the bessemer in point of annual production.

The production of bessemer and open-hearth steel in the United States has been as follows:

Year.	Open hearth.	Bessemer.
1876	19,187	469,639
1880	100,851	1,074,262
1885	133,376	1,519,430
1890	513,232	3,688,871
1895	1,137,182	4,909,128
1900	3,398,135	6,684,770
1905	8,971,376	10,941,375
1906	10,980,413	12,275,830
1907	11,549,736	11,667,549
1908	7,836,729	6,116,755
1910	16,504,509	9,412,772
1915	23,679,102	8,287,213

These statistics show that 1906 was the banner year for the production of bessemer steel. In 1907 the tonnage of open-hearth and bessemer differed by a very small amount, and in 1908, in the midst of a serious business depression, the output of open-hearth steel took a lead which has been constantly increasing.

Bright Smooth Surface on Castings

What process would you recommend to improve the appearance of gray iron castings on a job similar to a step door on a safe? We have been using a good grade of plumbago on these straight faces, yet the sand seems to burn on and it requires extra labor to obtain a good, smooth job.

Increase the silicon. If you make it 3 per cent, you will find that the graphite will form on the surface of the casting between the iron and the sand, which will cause the sand to peel off. The thinner you make the casting, if the silicon is high, the brighter the casting will be. The thin castings will not have enough weight to burn the sand into the casting. For a smooth casting, use fine sand, as is used for stove plate.

Iron and Money: Fact and Comment

Republic Iron & Steel Co. Reports Earnings of $47.95 a Share on Its Common Stock—"War Steel" Small Part of Sales

WHILE not over 7 per cent of the 1916 sales of the Republic Iron & Steel Co. consisted of the highly profitable "war steel", this company shows remarkable earnings, in common with all other steel companies. Its annual report, just issued, shows net earnings of $16,544,636. After deductions, including the regular 7 per cent on the preferred stock, there remained a balance of $13,039,163, equal to $47.95 on the common stock. Deducting back dividends of $2,750,000 and the common dividend leaves a surplus of $9,881,293, compared with $2,328,319 a year ago. The total surplus now stands at $18,236,252, compared with $8,943,669 a year ago. The Republic Iron & Steel Co. now has $9,608,139 cash on hand, compared with $3,700,237 a year ago. Its working assets are $19,721,350, compared with $13,510,788 a year ago. Since organization, the company has spent $30,198,822 on new construction. The income account for the fiscal year ended Dec. 31, 1916, compares as follows:

	1916	1915
Net earnings	†$16,544,636	$5,439,598
Interest and dividends	348,577	183,311
Total profits	$16,893,212	$5,622,909
Depreciation, etc.	$600,090	$600,388
Extra depreciation	400,000	400,000
Exhaust fund	245,222	236,798
Sink. fund	.....	.....
Total deduct	$1,245,312	$1,237,186
Net profits	15,647,900	4,385,723
Balance interest	858,737	869,904
Surplus	$14,789,163	$3,515,819
Dividend, 7 per cent.	1,750,000	1,187,500
Balance	*$13,039,163	$2,328,319
Back dividends	2,750,000	.....
Balance	$10,289,163	$2,328,319
Common dividends	407,865	.....
Surplus	$9,881,298	$2,328,319
Previous surplus	8,354,954	6,615,290
Total	$18,236,252	$8,943,609
Special appropriations	.....	588,655
Profit and loss	$18,236,252	$8,354,954

†After deduction of $2,138,373 for maintenance and repairs, and for special compensation under merit system plan.

*Equal to 47.95 per cent on $27,191,000 common stock, as compared with 8.56 per cent on same stock in 1915.

Unfilled orders for finished and semi-finished products and pig iron, as of Dec. 31, 1916, compare as follows:

	Finished products, etc.	Pig iron
Dec. 31, 1916	617,950	183,026
Dec. 31, 1915	591,270	138,406
Dec. 31, 1914	199,058	99,624
Dec. 31, 1913	120,959	49,290
Dec. 31, 1912	613,053	92,757
Dec. 31, 1911	414,431	158,392
Dec. 31, 1910	293,734	76,378
Dec. 31, 1909	457,785	39,995
Dec. 31, 1908	391,040	89,934

The gross volume of business during the year amounted to $52,844,017, compared with $29,916,228 in 1915 and $21,366,249 in 1914. The company expended $12,778,836 for labor during the year, compared with $8,558,574 in 1915 and $7,587,267 in 1914. The average wage per man in 1916 was $979; in 1915, $771; in 1914, $766.

Republic's production during the past two years is summarized as follows:

	1916 Gross tons	1915 Gross tons
Iron ore	1,689,213	1,440,376
Coke	*1,285,640	*1,119,157
Limestone	57,412	10,344
Pig iron	1,117,597	1,056,104
Bessemer steel ingots	718,377	578,940
Open-hearth steel ingots	541,594	464,208
Total steel ingots	1,259,971	1,043,148
Fin. and semi-fin. prod.	*1,216,716	*1,033,394

*Net tons.

Stocks Drop Little, Despite Events

Germany's notice of unrestricted submarine warfare put a bomb under the stock market. People who held stocks on a margin naturally were much disconcerted by news which seemed to foreshadow war with Germany. Fortunately a large short interest existed in the market, built up on a feeling that peace was near and that it would be a bad thing for the market. Stocks sold off from five to 15 points on Thursday, to levels which seemed almost ridiculous from the standpoint of earnings and dividend yields, especially among the steel stocks. On Saturday, however, when this country actually severed relations with Germany, the market took a brace and again this week displayed strength in the face of momentous world developments. The net declines in the steel stocks last week, while considerable, were insignificant in view of events. Quotations on a number of iron, steel and industrial shares at the close of the New York stock exchange Feb. 3 and net changes for the preceding week are as follows:

	Close Feb. 3.	Net chg.
American Can	43	−6¾
American Can, prfd.	106	−4
American Car & Fdy.	61	+2⅜
American Car & Fdy., prfd.	117½	− ⅜
American Locomotive	64⅜	−11
American Locomotive, prfd.	103½	−3
American Steel Foundries	55	−7
Baldwin Locomotive	46¾	−7½
Baldwin Locomotive, prfd.	100	−2
Bethlehem Steel	400	−30
Bethlehem Steel, prfd.	125	−1⅞
Colorado Fuel & Iron	43	−4
Continental Can	83	−6¼
Crucible Steel	57½	−6
Crucible Steel, prfd.	107	−7¼
General Electric	163	−7
Gulf States St'l, 1st prfd.	102	−3½
Gulf States Steel	106	−20
Gulf States Steel, 2nd prfd.	117½	−1
Internat'l Harv. of N. J.	114½	−5½
Internat'l Harv. Corp.	81	−4
Inter. Harv. Corp., prfd.	113½	− ½
Lackawanna Steel	74¾	−10⅛
Nat'l Enmlg. & Stamp. Co.	25	−4¾
Nat'l En. & Stmp. Co., pr.	96½	+ ½
Pressed Steel Car	76	−5½
Pressed Steel Car, prfd.	104	− ½
Pullman Palace Car	159¾	−5½
Republic Iron & Steel	74½	−4¼
Republic Iron & Steel, prfd.	100	−4
U. S. C. I. P. & Fdy. Co.	18⅝	−4⅛
U. S. C. I. P. & F. Co., pr.	55	−7¾
United States Steel	104	−9⅝
United States Steel, prfd.	120	− ⅞
Westinghouse Mfg.	49	−4¼

Maximum quotations for a number of steel and industrial stocks, not listed on the New York stock exchange, at the close Feb. 2 and Jan. 26, follow:

	Feb. 2.	Jan. 26.
American Radiator	420	420
American Ship Building	63	64½
Chicago Pneumatic Tool	72	74½
LaBelle Iron Works	81	79½
Lake Superior Corp'n	19¾	20¼
Stewart-Warner Speed. Co.	100	100
Warwick Iron & Steel Co.	9½	9½
Westinghouse Air Brake	154¾	157
Westingh'se Elec. & Mfg. Co.	53¾	53¾

Plan Abandoned

At a meeting of the board of directors of the Carbon Steel Co., Pittsburgh, Jan. 29, the proposed plan of reorganization of the company was declared inoperative and abandoned, and President Charles McKnight was requested to notify stockholders of this action. At an adjourned meeting of the stockholders, held earlier in the day, the plan for taking out a West Virginia charter was carried by an affirmative vote of 37,888 shares against a negative vote of 4,490 shares, but inasmuch as the proposition called for the acceptance of 95 per cent of each class of work, the board decided to abandon the plan.

Business News of Nation's Capital

Congress Disposed to Rush Preparedness Legislation—Contract for Guns Awarded Bethlehem—Decision on Rates from Pittsburgh to Seaboard

Bureau of *The Iron Trade Review*,
708 Metropolitan Bank Bldg.,
Washington, Feb. 6.

STIMULATED to action by reason of the international crisis, congress is in a frame of mind to hurry to completion such preparedness legislation as is still on the program. The house naval bill, it is believed, will not be changed in many respects by the senate, and may pass the latter branch of congress this week, following action on it by the house.

The bill was before the house when President Wilson delivered his address to congress, announcing that diplomatic relations between America and Germany had been severed and as soon as he had spoken these portentous words, Representative Britten presented an emergency bill carrying $119,000,000 for the immediate completion of 113 warships, authorized under previous sessions of congress and now in course of construction in the various government and private yards. The 113 ships include nine dreadnaughts, four battle cruisers, four scout cruisers, 28 destroyers, 63 submarines, one gunboat, one ammunition ship, two hospital ships and one transport. On the day previous, when the forthcoming break in relations between America and Germany was anticipated, Senator Poindexter announced he would offer as an amendment to the naval bill a provision for the immediate construction of 100 submarines, some to be used to protect the Pacific coast. These steps merely indicated in a general way the effect the international crisis has had on congress in the way of preparedness legislation. In the meantime, the professional peace-at-any-price advocates in congress, the baiters of private enterprise who supply the government with fighting ships and fighting materials, have been quiet, but for how long is merely a matter of speculation. The attitude of some members of congress who believed in adequate preparedness plainly would not tolerate without bitter attack any pacifist utterances these days.

But Secretary of the Navy Daniels apparently has not seen the full light. He has announced that plans for the government armor plate and projectile plants will proceed as has been heretofore proposed, regardless of the seriousness of the international situation.

This program called for an itinerary of the first inspection trip of the armor plant board, as follows:

Leave Washington Feb. 4, and visit Huntington, W. Va., Feb. 5; Ironton, O., and Ashland, Ky., Feb. 6; Charleston, W. Va., Feb. 7, and Cumberland, Md., Feb. 9.

The dispatch last week from American Ambassador Page at London that while British authorities felt constrained to withhold consent for Hadfields, Ltd., Sheffield, Eng., to make shells for the American navy for the present on account of national needs, officials of the concern were reasonably sure that objection would disappear within 12 or 15 months, has settled the Hadfield matter. Particularly at this time, even Mr. Daniels would not dare to wait until a nameless date for the receipt of the shells. Mr. Daniels met the announcement with the statement that the department would advertise this week for machinery for the government projectile plant. It seems questionable whether he will receive many, if any, responses at this time, or in the remote future. The secretary admitted, however, that he is holding a series of conferences with American makers of projectiles, and said further slight concessions in prices have been made by them. It has been stated that now, in view of the probability of war, they may offer shells to the government at its own prices. The secretary also said that one company had offered to sell or lease its projectile plant to the government. Mr. Daniels said he has asked that this offer, made verbally, be placed in writing. It is reported that the company referred to is the Washington Steel & Ordnance Co., Giesboro, Md., near Washington, D. C.

Millions for Fortifications

Washington, Feb. 6.—Carrying an appropriation of $51,396,593, with contract authorizations of $9,459,000, or a total of $60,855,593, the fortifications bill passed the house and senate by an overwhelming vote. Last year there was presented to the sub-committee of the committee on appropriations in charge of the bill the report of a board of review that had made a review of all the fortifications of the continental United States, the Panama canal, and of the insular possessions. The board determined what it considered is necessary to add to the existing armament or to place as new armament in places not heretofore fortified, to protect within the proper scope of fortifications the United States, the Panama canal and the insular possessions. That report contemplated an expenditure of $96,000,000, and for the continental United States an expenditure of about $71,000,000. It was supposed that the estimates that were submitted last year represented about one-fourth of the amount requisite to carry out this scheme of the board of review.

"In point of fact, however," said Chairman Sherley, of the committee, "the estimates that were submitted and the allowances that were made did not constitute a fourth of the project, even if you considered authorizations as well as cash appropriated. Since that report was presented certain additions have been made to it which will result in an increased expenditure, taking into account the increased cost of doing the same thing over last year, of probably a sum sufficient to make the total reach $110,000,000."

The bill of this year undertakes to provide for a third of the little more than three-fourths of the scheme remaining to be appropriated for. The actual physical doing of these things, it was pointed out, will take much longer than was contemplated originally through four annual appropriations, because it takes from six to seven or eight years to actually create and turn over to the coast artillery a new fortification, even though the money be supplied as fast as it can be used. Mr. Sherley explained that the thing that determined practically the time it takes to equip a modern fortification, assuming that title is held to the necessary land, is the making of guns and carriages. He said that it takes, particularly for such new guns as are being built, never heretofore built in America, from three to five years.

There is in this year's bill an added expense due to the fact that a 25 per cent increase in the cost of armament and a 20 to 25 per cent increase in ammunition now exists. Like the current fortifications measure, the bill of this year carries a provision that no moneys can be expended for the

procurement of anything from private manufacturers at a cost which shall be greater than 25 per cent in excess of the estimated arsenal price of manufacture. The existing act carries a provision for $1,000,000 for the equipment of private plants with jigs, dies, tools, etc., to enable them to manufacture guns and ammunition that might be needed by the government. This year, $500,000 was submitted as an estimate for a similar purpose, but Mr. Sherley said, it developed in the hearings that the $1,000,000 had not been expended due to two causes: First, it was the belief of the war department that it ought not to place this money among various manufacturers who were then considering proposals for bids to the government until after those bids had been made, because, manifestly, it would have been unfair to give one manufacturer as against another the advantage in bidding that would come from this equipment. The other reason, continued Mr. Sherley, and perhaps one of more importance, was that the whole matter had been submitted to the council of national defense touching the plan that should be followed in supplying these manufacturers, the type of manufactures, their location and their probable output, all of those matters being proper and necessary matters to determine before this money could be wisely expended. In view of the fact it now has $1,000,000 the committe said it did not feel warranted in adding to that sum until it had actually ben used, and benefit had been secured of experience gained from that expenditure.

The anti-efficiency rider in the bill was discussed sharply in the senate, but those opposed to it made no effort to have it eliminated because, they explained, it would be futile inasmuch as this legislation seems to have become a fixed policy. But they expressed the belief that after the country realizes how it lowered efficiency, decreased salaries of employes and increased the cost of government manufacture, a demand will be made to abolish that sort of legislation.

Guns Awarded

Washington, Feb. 6.—In striking contrast to his usual policy of condemning manufacturers on account of their prices and delaying the award of contracts indefinitely, Secretary of the Navy Josephus Daniels let a contract last week to the Bethlehem Steel Co. for 40 6-inch guns on the day after bids were opened: It is assumed that the international situation finally aroused Secretary Daniels so much that he cast aside his narrow policy and awarded the contract in order that it could be fulfilled as quickly as possible. The Bethlehem bid was $13,875 each for the guns, one to be delivered in 16 months and three thereafter a month. Efforts will be made, it is understood, to hasten the completion of the guns in view of the fact that relations between America and Germany have been broken. The only other bidder on the guns was the Midvale Steel & Ordnance Co., which put in a figure of $14,125 each, one gun to be delivered in 12 months and two a month thereafter. The bids were opened last Wednesday by the bureau of ordnance, navy department.

Increase in Rates Approved

Washington, Feb. 6.—The interstate commerce commission handed down a decision last Saturday justifying the proposal of the railroads to apply the present domestic rates on iron and steel products for export from the Pittsburgh district to the Atlantic seaboard. The increase in rates, amounting to approximately 33 1/3 per cent, is contingent upon Chicago, Cincinnati and other points in central freight association territory being given rates to the seaboard properly adjusted thereto. The proposed schedules increasing the rates will continue to be held under suspension until new tariffs are filed in accordance with the views of the commission. The decision held as not justified those tariffs filed in connection with the eastern export iron and steel case which would, other than indicated, increase rates in central freight association and trunk lines territories to Atlantic ports and from points in central freight association territory to gulf ports.

The tariffs involved were filed to become effective on Oct. 1, 1916, and proposed cancellation of export commodity rates on pig iron, billets and manufactured iron and steel articles from producing points in central freight association and trunk line territories to the Atlantic ports and to apply their domestic rates instead. The export rates are about 66 2/3 per cent of the domestic rates. The export rates from Cincinnati, St. Paul, Chicago, St. Louis and several points in Indiana, Wisconsin, Iowa, Michigan, Kentucky and Illinois to the gulf ports were also proposed to be canceled or increased, effective Oct. 1. These rates, however, are fixed by the rates to the Atlantic seaboard. Since they are made to equalize the gulf ports with the seaboard, as a practical matter, says the commission, they must stand or fall with the rates to the seaboard, and therefore are not dealt with specifically.

The railroad and most of the steel interests, according to hearings on the case involved, are understood to have reached an agreement that the existing export rates would be restored after the conclusion of the war, if that became necessary as an aid to the steel industry in building up its export trade. The commission says:

"We hold that the carriers have not justified, as a whole, the proposed cancellation of their export rates to the seaboard and the substitution of their domestic rates instead, but that the rates from Pittsburgh and the related points may be allowed to go into effect, provided rates for export traffic are published from Chicago which are related to the Pittsburgh rates as 100 is to 60, and from Cincinnati which are related to the Pittsburgh rates as 87 to 60. Similar adjustment should be made with respect to other producing points west of Pittsburgh. Such rates may be made effective upon five days' notice to the commission."

Commissioners Clements and Hall dissented from the majority opinion. Both held that the merits of the case might well have been inquired into through investigation.

The New Westinghouse Plant

The Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has offered additional information about its new works at Essington, Pa., where the company recently purchased a site of about 500 acres, with a frontage of approximately one mile on the Delaware river. Additional transportation facilities will be afforded by sidings connecting the Pennsylvania and the Philadelphia & Reading railroad.

The new works will be devoted to the production of large apparatus, including power machinery, principally steam turbines, condensers and reduction gears. The following buildings will be erected at an early date: Two large machine shops, an erecting shop for heavy machinery, a forge shop, pattern and pattern-storage shops and power house. The fabricated material, as previously reported in these columns, will be furnished by the McClintic-Marshall Co. and L. F. Shoemaker & Co. Approximately 7,500 tons will be involved in this work. The initial development will cost between $5,000,000 and $6,000,000. Officials of the company state that eventually 20,000 people will be employed at the Essington works.

MEN OF THE IRON TRADE

Who they are **Where they are** **What they are doing**

THE American Steel & Wire Co. announces the following appointments: Jay Waldeck to be assistant manager of wire mills, Cleveland district; Charles W. Lutz, to be assistant manager wire mills, Pittsburgh district, succeeding Mr. Waldeck; T. D. Temple, to be district superintendent Birmingham district, succeeding Mr. Lutz; H. O'Connor, superintendent Anderson works, succeeding Mr. Temple; F. Berschid, superintendent North De Kalb works, succeeding Mr. O'Connor. All changes were effective Feb. 1.

E. W. Richey has been elected vice president and J. G. Coles treasurer, of the Standard Forgings Co., with offices at 411 Railway Exchange building, Chicago.

J. D. Billard Jr., managing director of the Austrian magnesite works of the American Refractories Co., arrived Jan. 31 at New York from Radentheim, Austria, by way of Copenhagen, Denmark. This is his first visit to the United States since the European war started.

At the annual meeting of the stockholders of the S. M. Jones Co., the office of vice president was created and Paul H. Jones was elected in that capacity. Percy C. Jones was re-elected president; Mrs. H. B. Jones, a vice president; A. H. Emerson, secretary, and John H. Good, treasurer.

Percy M. Brotherhood, of Manning, Maxwell & Moore, Inc., New York, and Mrs. Brotherhood; A. E. Newton, of Reed-Prentice Co., Worcester, and Mrs. Newton; and J. F. Jennison, of the Jennison Mfg. Co., Fitchburg, Mass., and Mrs. Jennison, will leave on the steamer BRAZOS Feb. 24 for a 2 to 3 weeks' trip to Porto Rico.

Jas. H. Hammond, formerly president of the Superior Steel Co., Carnegie, Pa., has been elected chairman of the board; E. V. Harrison, the former vice president, has been made president, and H. F. Devens, former general sales manager, nas been advanced to vice president.

Julian Kennedy, Pittsburgh, engineer in charge of the design and construction of the new plant of the Keystone Steel & Wire Co., Joliet, Ill., has retained Barton R. Shover, consulting engineer, Pittsburgh, Pa., as consulting electrical engineer on the application of power to the equipment for that plant.

D. D. Hull Jr., of Roanoke, Va., who was recently elected vice president of the Virginia Iron, Coal & Coke Co., is a native of Marion, Va., and 44 years of age. He was educated as Emory and Henry college and at the University of Virginia, graduating from the latter in law. After practicing for a time at Pulaski, Va., he moved to Bristol, Va., and became a member of the firm of Bullitt, Kelly & Hull. Until he moved to Roanoke in 1908, he was general counsel of the Virginia & Southwestern railway.

D. D. HULL JR.

Mr. and Mrs. Andrew Carnegie have purchased the $2,000,000 property of Shadow Brook, Lenox, Mass., from Spencer B. Shotter, Savannah, Ga., for $300,000. It comprises 123 acres of park, a mansion and other buildings and also 240 acres of land on Bald Head mountain, certain Lake Mahkeenac short front property and a boathouse.

W. H. Marshall, formerly president of the American Locomotive Co., is to become associated in the near future in a responsible capacity with J. P. Morgan & Co. It is understood that recognition of the successful execution of munition contracts by the American Locomotive Co. during Mr. Marshall's administration has led to his new connection.

Charles Page Perin, consulting engineer, New York City, for about 16 years, and Stewart M. Marshall, formerly chief engineer of the Cambria Steel Co., Johnstown, Pa., and recently chief engineer of the Southwark Foundry & Machine Co., Philadelphia, have formed a partnership as consulting engineers, with offices at No. 2 Rector street, New York.

Geo. A. Maher, who has been connected with the home office of the C. M. Hall Lamp Co., Detroit, will assume the position of general manager of the plant of the Badger Brass Mfg. Co., Kenosha, Wis., which was recently acquired by the Hall Co. W. F. Anklam, formerly associated with the Badger Co., has been appointed secretary and managing director of the Hall company.

Milford Wortham has taken charge of the Temple, Pa., furnace of the Seaboard Steel & Manganese Co., which is about to begin the manufacture of spiegeleisen. Mr. Wortham formerly had directed the manufacture of ferro-manganese at the Cornwall, Pa., furnace of the Lackawanna Iron & Steel Co. Henry Broden recently resigned as manager of the Temple furnace.

G. P. Blackiston, of Canton, O., has been appointed advertising manager of La Belle Iron Works, Steubenville, O. Mr. Blackiston has spent 18 years in touch with the iron and steel business. During the past nine years, he has concentrated on publicity and sales work. He formerly acted as advertising manager of the United Steel Co., the Berger Mfg. Co., and the Stark Rolling Mill Co., Canton.

William H. Bennett, who for the past year has been advertising manager of the Searchlight Co., Chicago, has joined the forces of the Service Motor Supply Co., Fifteenth and Michigan boulevard, Chicago. This action is occasioned by the consolidation of the Searchlight Co. with the Air Reduction Co., of New York City, and the removal of the Searchlight interests to the east.

Henry Lindenkohl has been appointed engineer of construction of the American Locomotive Co. with headquarters at Schenectady, N. Y. Mr. Lindenkohl was educated in the

MEN OF THE IRON TRADE

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public schools of Elizabeth, N. J., and at Stevens Institute of Technology, where he was graduated as a mechanical engineer in 1905. In the same year he became an inspector of new buildings at Providence for the American Locomotive Co. In 1908 he was transferred to the general building construction department of the company at Schenectady and remained there until his appointment as engineer of construction.

Announcement is made by the National Association of Manufacturers of the appointment of Carl M. Hansen, who has had wide experience in connection with accident prevention, compensation and casualty insurance, as chairman of the association's committee for accident prevention and workmen's compensation. Mr. Hansen is managing director of the Pennsylvania Mutual Liability Association, organized by employers to carry compensation on the mutual plan in that state, and is also secretary and general manager of the Pennsylvania Bituminous Mutual Association, organized among coal operators in Pennsylvania for the same purpose.

Murray M. Duncan, general manager of the Cleveland-Cliffs Iron Co., has been elected vice president of the company, to succeed the late J. H. Sheadle. He will be vice president in charge of mining operations and will retain the duties of general manager, continuing to have offices in Marquette. Other officers were reelected at the recent meeting, as follows: President, W. G. Mather; treasurer, R. C. Mann; secretary, S. L. Mather; assistant treasurer, C. G. Heer; assistant secretary, E. H. James; auditor, C. D. Mason. Directors are: W. G. Mather, Samuel Mather, S. L. Mather, J. H. Wade, J. H. Hoyt, C. W. Bingham, Trueman H. Newberry and M. M. Duncan.

C. D. S. Miller and W. R. Palmer, president and vice president, respectively, of the American Tube & Stamping Co., Bridgeport, Conn., have resigned. These changes are in pursuance of the recent reorganization of the company. J. V. W. Reynders, chairman of the board, is acting as president temporarily and Guy P. Miller, of the Bridgeport Brass Co., similarly is serving as vice president. The American Tube & Stamping Co., under its new management, is proceeding to carry out plans which will greatly enlarge its output of cold rolled strip steel. A new 12-inch cold rolling mill has been installed. The open-hearth plant is to be extended, but the number of furnaces and other details have not yet been worked out.

L. W. Lukens, recently resigned as superintendent of the Illinois Malleable Iron Co., Chicago, in order to accept

L. W. LUKENS

the position of foundry superintendent of the new plant of the Saginaw Malleable Iron Co., Saginaw, Mich. In his new position, Mr. Lukens will be associated with C. F. Drozeski, general manager. Mr. Lukens, who is widely known among western foundrymen, was connected with the Illinois Malleable Iron Co. continuously for 24 years.

T. S. Bird, formerly superintendent of the foundry operated by the Michigan Motor Casting Co., Flint, Mich., has accepted the position of general superintendent of the new Ecorse Foundry & Machine Co., Ecorse, Mich.

Barton R. Shover, who recently returned from Sakchi, India, where he was general manager of the Tata Iron & Steel Co., has opened offices at 704 Diamond Bank building, Pittsburgh, as consulting engineer on steam and electrical application in the iron and steel industry. Mr. Shover has been actively connected with the steel industry for the last 22 years. Before going to India, he was general superintendent of the Brier Hill Steel Co., Youngstown, O. Upon entering the electrical branch of the industry, he became identified with the Carnegie Steel Co. and at one time was electrical engineer of that concern in the Youngstown district. Later, he was electrical engineer for the Indiana Steel Co., at Gary, Ind., said to be the first plant to adopt the electric drive throughout its works. He is a member of the American Iron and Steel Institute, fellow of the American Institute of Electrical Engineers and past president and one of the founders of the Association of Iron and Steel Electrical Engineers.

C. K. Lassiter has been made vice president of the American Locomotive Co., in charge of manufacturing, the appointment having taken effect Feb. 1. He entered the services of the Richmond Locomotive Works in 1892, as clerk in the piece-work department. In 1894, he was made chief clerk to the late Joseph Bryan, then president of the Richmond Locomotive Works. In 1902, Mr. Lassiter was transferred to the Schenectady plant of the American Locomotive Co. as chief clerk to the general manager. He was later appointed mechanical expert in charge of designing, developing and maintaining r.ll shop experiment, shop systems and piecework departments. He developed and installed the new drop hammer department for the making of forgings for all the American Locomotive Co.'s plants. He also standardized the small work departments and developed and patented special machines for producing engine bolts and boiler stay bolts. In 1907 he was transferred to the American Locomotive Co.'s New York office and made mechanical superintendent in charge of all betterments, designing, specifying and maintaining shop equipment and power house operations for all of its plants. Aside from his identification with the American Locomotive Co., Mr. Lassiter served as president of the Baush Machine Tool Co., Springfield, Mass. He was also president of the Quigley Furnace & Foundry Co., of the same city, and acted as consulting engineer for various industrial plants throughout the country.

Exports of Pig Iron Are Growing

But Represent in a Month Only a Day's Production of Blast Furnaces—Interesting Figures for the Past Year's Movement

FOR the third time during the past year, the exports of pig iron in December amounted to more than 100,000 tons, the December movement being 105,195, a little more than the output of coke and anthracite furnaces of the country for one day in December, when the daily average was 102,715 tons. The exports of pig iron for the year amounted to 612,241 tons. The exports of billets and other semi-finished materials which declined in November, advanced to 162,901 tons in December, or almost the same as in October. The following table shows exports of pig iron and semi-finished material for the year 1916 in gross tons:

1916.	Pig iron.	Semi-finished material.
Jan.	18,719	55,315
Feb.	15,061	87,306
Mar.	19,110	107,696
Apr.	18,518	88,764
May	28,293	142,782
June	48,770	116,425
July	28,718	135,827
Aug.	60,264	160,921
Sep.	64,122	163,104
Oct.	101,756	162,679
Nov.	102,786	125,038
Dec.	105,195	162,901

The total value of exports of iron and steel and the manufactures thereof, as reported by the bureau of foreign and domestic commerce, amounted to $88,136,958 in December, 1916, compared with $45,825,147 in December, 1915, and $77,570,840 in November, 1916, while for the 12 months ending December, 1916, the value was $867,323,044, compared with $388,400,832 for the same period in 1915. The value of imports of iron and steel and the manufactures thereof show very little increase for the 12-month period, the 1916 figure being $27,986,951, compared with $20,380,093 for 1915. The December iron and steel imports were valued at $2,722,246, compared with $1,835,250 in December, 1915, and $2,297,299 in November, 1916.

VALUE OF EXPORTS OF MACHINERY.

1915.	Motor trucks.	Agricultural implements.	Aeroplanes.	Metal working machy.
June	$8,578,802	$854,670	$283,212	$3,735,562
July	6,803,001	963,534	880,836	3,872,358
Aug.	4,387,193	1,454,606	588,600	3,624,411
Sept.	5,882,255	1,092,797	101,950	3,363,973
Oct.	4,307,209	818,606	366,892	3,236,079
Nov.	3,837,307	1,054,235	13,770	4,644,713
Dec.	3,920,533	1,338,629	156,347	3,205,788
1916.				
Jan.	3,416,618	1,139,874	.....	3,249,595
Feb.	6,170,367	1,323,578	22,320	4,662,905
Mar.	4,909,179	2,287,605	8,400	6,501,022
Apr.	5,259,480	2,066,512	.....	6,552,397
May	4,357,238	2,277,966	.....	9,935,806
June	3,551,148	1,793,355	20,000	8,465,985
July	3,062,670	2,016,091	10,000	7,814,691
Aug.	4,442,158	2,513,243	24,000	8,134,473
Sept.	5,203,215	1,804,475	5,000	7,901,328
Oct.	3,635,291	2,023,704	800	5,292,802
Nov.	5,175,114	1,596,387	20,000	4,681,652

In December, 49,796 tons of manganese ore were imported, compared with 62,477 tons in December, 1915, and 31,225 tons in November, 1916. Ferro-manganese imports continue to decline, only 4,531 tons being imported in December, compared with 6,232 tons in November and 8,114 tons in October.

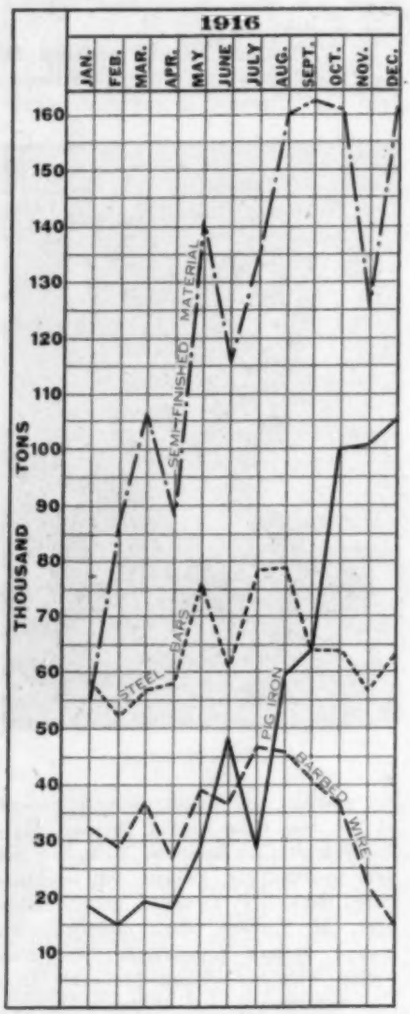


Chart Showing Exports of Semi-Finished Material, Bars, Barbed Wire and Pig Iron in 1916

Some very interesting figures in regard to exports of cars for railways are shown in the November report of the bureau, which has just been published. Passenger cars for steam railways exported in November were valued at $100,266, compared with only $321 in November, 1915, while all other cars for steam railways were valued at $1,968,549, compared with $3,393,126 in November, 1915. For the 11-month period ending with November, 1916, the total value of exports of passenger and all other cars for steam railways combined amounted to $23,096,167, compared with only $7,-

IMPORTS AND EXPORTS, GROSS TONS.

1915.	Imports.	Exports.
July	20,858	380,340
August	27,556	405,850
September	23,345	382,113
October	34,318	349,843
November	37,131	362,764
December	35,408	353,853
1916.		
January	15,824	354,416
February	20,279	368,869
March	15,159	438,054
April	20,176	384,917
May	32,114	540,580
June	26,786	526,759
July	14,729	503,187
August	32,257	597,739
September	25,559	643,762
October	30,169	610,110
November	42,545	554,856
December	44,134	580,957

IRON ORE IMPORTS, GROSS TONS.

	November, 1916.	November, 1915.	Eleven months end'g November, 1916.	Eleven months end'g November, 1915.
Spain	4,295	6,000	143,470	38,946
Sweden	14,443	12,988	193,352	198,186
Canada	1,069	10,946	136,835	82,795
Newfoundland & Labrador.	.....	.....	.....	.....
Cuba	45,350	65,340	635,191	750,198
Other countries	17,100	18,270	98,845	152,835
Total	82,257	113,544	1,207,693	1,222,960

	December, 1916.	December, 1915.	Twelve months end'g December, 1916.	Twelve months end'g December, 1915.
Scrap	14,860	16,276	212,765	79,361
Pig iron	105,195	21,807	612,241	224,509
Billets, ingots and blooms of steel	162,901	49,952	1,508,727	560,704
Wire rods	13,414	13,458	158,281	165,010
Steel rails	41,125	40,831	540,349	391,379
Steel bars	63,288	49,566	774,440	426,669
Iron bars	6,341	3,990	74,068	39,739
Struc. iron and steel	35,648	18,920	301,649	232,139
Hoops, bands and scroll	3,038	3,006	43,207	29,249
Sh'ts & plates	50,190	31,813	515,452	419,595
Tin & terne plate	18,229	16,972	227,387	154,638
Barbed wire	15,821	26,175	418,874	248,607
All oth. wire	14,484	22,111	264,137	224,968
Cut nails	223	248	4,752	4,236
Wire nails	11,012	8,488	150,170	91,582
All oth. nails incl. tacks	1,303	1,083	12,353	9,250
Pipes & fit'gs	19,921	23,145	228,568	176,984
R. R. spikes	1,391	2,630	23,851	13,256
Bolts, nuts, rivets & washers	2,231	2,501	29,231	23,535
Horseshoes	145	544	7,806	15,868
Cast radiators	197	337	2,424	2,291
Total	580,957	353,853	6,110,732	3,532,564

242,277 in the 11 months of 1915.

The value of zinc ore exports in November was slightly below that of the preceding month, but shows a considerable increase over November, 1915, the figures being $6,099,603 for

	December, 1916.	December, 1915.	Twelve months end'g December, 1916.	Twelve months end'g December, 1915.
Scrap	31,424	20,666	116,039	79,982
Pig iron	8,176	11,620	135,349	89,836
Ingots, bl'ms and billets of steel	2,552	880	26,141	14,998
Wire rods	653	471	4,130	5,316
Rails	522	1,280	26,299	78,525
Bar iron	277	238	7,701	8,474
Structural	261	79	1,473	1,494
Sheets and plates	235	113	1,730	1,420
Tin and terne plate	34	61	1,008	2,350
Total	44,134	35,408	319,870	282,332

November, 1916; $6,710,442 for October, 1916, and $4,231,158 for November, 1915.

The value of machinery exports for November, 1916, amounted to $18,999,400, compared with $18,479,007 in October, 1916, and $15,838,119 in November, 1915. Motor truck and aeroplane exports show an increase, while the value of November exports of agricultural implements and metal working machinery decreased.

Technical Program

Of Mining Engineers' Convention Promises Much of Interest

An unusually well balanced program of technical papers has been prepared for presentation at the meetings to be held during the convention of the American Institute of Mining Engineers in New York, Feb. 19 to 22 inclusive. The general outline of the program of the convention was given in last week's issue of *The Iron Trade Review*. Many of the sessions included on the technical program are of interest to men of the iron and steel industry.

The session on metallography Monday, Feb. 19, is of particular interest. The program for this meeting is as follows:

METALLOGRAPHY.

Grain Growth Phenomena in Metals, Zay Jeffries; On Grain Growth, Henry M. Howe; Recrystallization after Plastic Deformation, Henry M. Howe; Tungsten and Molybdenum Equilibrium Diagram and System of Crystalization, Zay Jeffries; The System Tungsten-Molybdenum, Frank Alfred Fahrenwald.

The papers on iron blast furnace practice, which will be presented Tuesday afternoon, include the following:

IRON BLAST FURNACE PRACTICE.

Dry-Hot versus Cold-Wet Blast Furnace Gas, Linn Bradley, H. D. Egbert and W. W. Strong; Some Suggestions Regarding Construction of Hot-Blast Stoves, Linn Bradley, H. D. Egbert and W. W. Strong; Calculations with Reference to he Use of Carbon in Modern American Blast Furnaces, Henry Phelps Howland; Potash as a By-Product from the Blast Furnace, R. J. Wysor.

The session on Wednesday devoted to the manufacture of iron and steel is of more than ordinary interest. The program for the morning session includes:

MANUFACTURE OF IRON AND STEEL.

The Seasoning of Castings, Richard Moldenke; Significance of Manganese in American Steel Metallurgy, F. H. Wilcox; Roll Scale as a Factor in the Bessemer Process, A. Patton and F. N. Speller; Temperature measurements in Bessemer and Open-Hearth Practice, George K. Burgess; The Manufacture of Weldless Steel Tires for Locomotive and Car Wheels, Builliaem Aertsen.

Among the papers to be given Wednesday afternoon are the following which are devoted to metallography and the heat treatment of steel:

METALLOGRAPHY AND HEAT-TREATMENT OF STEEL.

Notes on the Heat Treatment of High-Speed Steel Tools, A. E. Bellis and T. W. Hardy; Effect of Time in Reheating Hardened Steel Below the Critical Range, C. R. Hayward and S. S. Raymond; Erosion of Guns—The Hardening of the Surface, Henry Fay; The Effect of Sulphur on Low-Carbon Steel, Carle R. Hayward; A Method for Distinguishing Sulphides from Oxides in the Metallography of Steel, George F. Comstock.

Several of the above papers have been published in recent issues of *The Iron Trade Review*, among which are: "Grain Growth Phenomena in Metals", by Zay Jeffries, which appeared in the issue of Jan. 25. The paper by Henry Fay on "The Erosion of Guns" was published in the Dec. 14 issue. The paper on "Potash as a By-Product From the Blast Furnace", by R. J. Wysor, was published in the issues of Jan. 18 and 25.

Ambitious Cities

Leaders in industrial circles and in the civic bodies of Birmingham are working hard in the preparations for the reception of the committee named by the Secretary of the Navy to investigate sites and localities for the proposed government armor plate plant. Data as to the ores, coal, coke, iron and steel produced in this section are being gathered and experts will present the facts. Three cities ask to be selected as the location of the plant—Birmingham, Gadsden and Tuscaloosa.

"The Burning of Blast Furnace Gas Under Boilers" was discussed, Feb. 6, at the annual meeting of the mechanical section of the Engineers' Society of Western Pennsylvania. The meeting was held in the society rooms in the Oliver building, Pittsburgh. Members talked about gas consumers, boiler plants and the operation of boilers fired by blast furnace gas.

Coke By-Products

Inquiry for Large Amount of Benzol is Pending

New York, Feb. 6.—An inquiry for 200,000 gallons monthly of pure benzol for the year of 1917, or in excess of 2,000,000 gallons, in total, is pending, but some doubt is expressed that this inquiry will result in business. It would be very difficult to obtain so large a supply with the market sold up as at present. Domestic buyers continue to place some contracts for benzol for delivery this year, and in some cases for a term of three years. Some home buyers have yet to close and show unwillingness to pay the current prices of 55 to 60 cents per gallon. They are offering lower figures which have not been accepted. The number of inquiries in the market is large, but it develops these have originated with two or three buyers.

Toluol production is about up to expectations and as sales have followed closely the probable output, unsold offerings are small. Some producers turned out an unprecedented amount during January and others fell below the expected mark. Prices have continued from $1.50 to $1.75, per gallon, for contract, and 25 cents higher for spot. Phenol is quoted at from 50 to 55 cents, per pound. Some spot sales of limited amounts have been below 50 cents. Solvent naphtha supplies continue in excess of demand. Prices are at 25 to 30 cents, per gallon, but the lower figure can be shaded on large orders.

The acute tension reached in the relations between this country and Germany has had no effect as yet in bringing the government into the market as a buyer of high explosive chemicals. Recently, as previously reported, the government closed a fair-sized purchase of toluol which was a regular matter. It follows, of course, that should the government desire to make a quick purchase of such products as benzol, toluol and phenol, makers readily would procure for it all the supplies desired and this would involve probably the transfer of some product now under contract, particularly with foreign governments. The urgency of the government's needs would determine the extent of these transfers.

Early demand for sulphate of ammonia, while not large, is in excess of the supply and prices still rise. This week, they are quoted from $4.18 to $4.20, per 100 pounds, at tidewater. Additional prices may be found on page 396a.

Douglas I. McKay and Sanger B. Steel have been elected vice presidents of J. G. White & Co., New York.

War Crisis Booms Tool Markets

Submarine Activities May Delay Foreign Shipments of Machines—American Users Eager to Snap Up Any Available Equipment—Prices Advance in Several Centers—Deliveries Tighten

THE institution by Germany of so-called "barred zones" around the allied countries and the break with Germany, are factors which have greatly complicated the outlook in the machine tool market. The extent to which the new German submarine operations will interfere with shipping undoubtedly will be measurable. The fact that the allies may have failed to anticipate these developments is considered as partly accountable for the loss which so far has taken place, and the situation in shipping, therefore, is being watched with anxiety by all exporters and manufacturers who are booking an export business. The breaking up of ocean commerce to a serious degree would mean the exporting of fewer machine tools, and the accumulation of stocks would tend to have an adverse effect on the market from the seller's point of view. The break with Germany, however, generally is looked upon as a strengthening factor, because the naval construction program probably will be enlarged and executed more vigorously, thus affording a more extensive outlet for machine tools.

The current demand for machine tools reflects a decided improvement over last week. The most important development in the way of new business is the purchase by the General Electric Co. of more than $750,000 worth of tools for installation at its Erie, Pa., Lynn, Mass., and Schenectady, N. Y., plant, as well as in the new plant which it is about to erect at Bloomfield, N. J. The list closed was sent out about 10 days ago and involved between 100 and 150 heavy tools, such as large boring mills, milling machines, radial drills, lathes and planers. This buyer now is expected to take action shortly on several extensive lists of smaller tools for installation at its Bloomfield and other plants. Another large buyer is the Tennessee Coal, Iron & Railroad Co., which has placed orders for general machine shop equipment, involving an outlay of more than $100,000. The Newport News Ship Building & Dry Dock Co. has placed some important orders and it is understood that the Seattle Construction & Dry Dock Co. has closed on the large list which it recently issued. Demand from the railroads reflects the general improvement. The Great Northern and the Northern Pacific roads have closed the large lists which they had pending for some time past; the Union Pacific is completing the distribution of orders for its requirements. The New York Central, Pennsylvania and Baltimore & Ohio each has bought a few tools. George E. Sealy & Co., 39 Cortland street, New York, are in the market for boiler and tank shop equipment. Prior to the international developments of last week, a large foreign business was being closed, principally for shipment to France, Italy and England, but the tendency since has been to postpone action on additional foreign business. A number of important inquiries from abroad now are pending. Browne, McFarlane & Co., 120 Broadway, New York, are in the market for a 50-ton crane; the Utah Copper Co., 25 Broad street, New York, is in the market for a 50-ton crane; the Utica Steam & Mohawk Valley Cotton Mills, Utica, N. Y., are in the market for a 10-ton crane; the Boston elevated railroad is taking bids on a 10-ton crane. The Morgan Engineering Co. has taken a contract for two soaking pit cranes for the Bethlehem Steel Co.

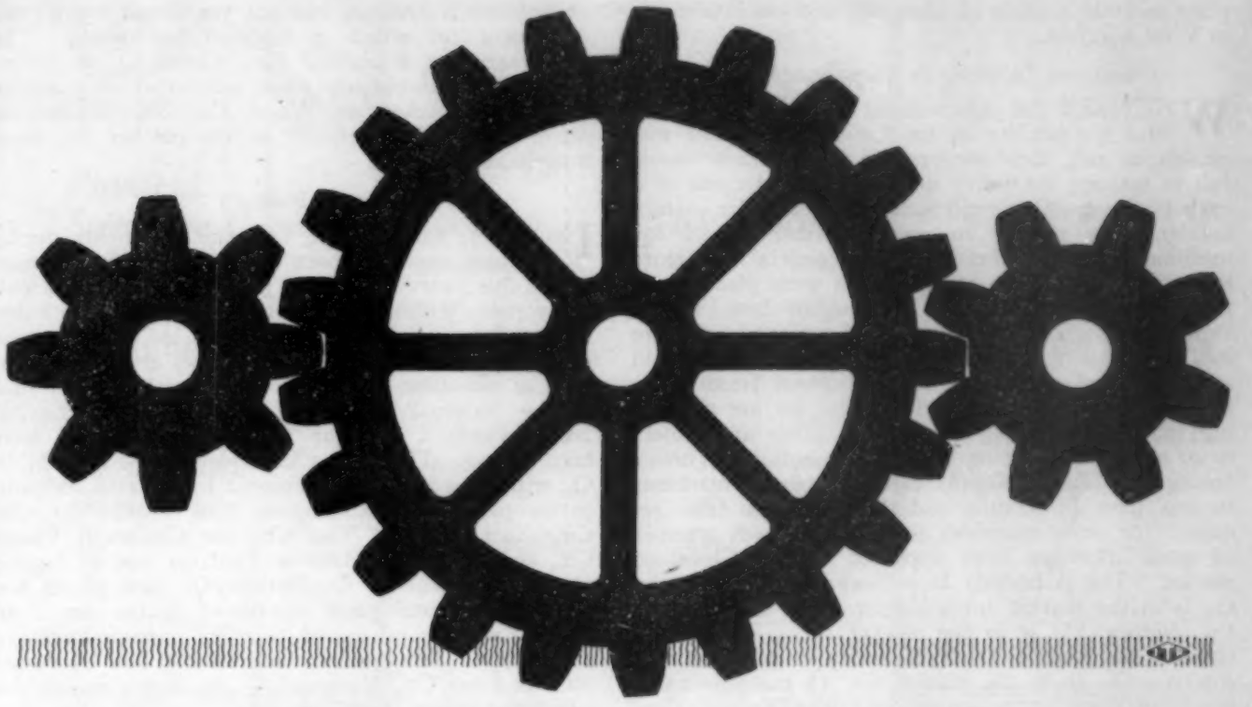
Chicago Market Picking Up Under Stimulus of Railroad Buying

PRICE advances continue to be made from week to week. The changes are not uniform and individual builders announce the changes separately. During the past week notice has been received of an increase of about 5 per cent on drills. The market is reviving under the influence of railroad buying, which is a feature of the Chicago market. The Santa Fe has an inquiry out for a 48-inch planer. The Union Pacific is buying various tools on its recent large inquiry. Other roads seem to have completed their purchases.

A heavy demand for ship equipment is arising from a number of large beet sugar mills in the west. Extensions of machine shops continue to be made and new plants are being erected by a number of concerns. The Llewellyn Iron Works, Los Angeles, is about to rebuild two burned machine shops. The Buda Co. is about to erect a machine shop at its works at Harvey, Ill. The Foster Machine Co., Elkhart, Ind., is building an addition. The Turner Mfg. Co., Chicago, is said to have plans for an unusually large power installation at its new plant. E. J. Mills & Co., Newton, Ia., are building a machine shop. The Ryan Car Co., Hegewisch, Chicago, is about to add largely to its plant and enlarge its output of steel cars. The new plant of the James S. Kirk Soap Co., Chicago, will include a large power installation. The Diamond T. Motor Co., Chicago, will build a large plant in the spring. Announcement of the electrification of another section of the Milwaukee road over the Cascade mountains foreshadows considerable demand for equipment. The Elgin Motor Truck Co. is the new name of the New Era Engineering Co., Joliet, Ill., which has increased its capital from $200,000 to $1,000,000 to cover greatly enlarged facilities.

Pittsburgh Market Rallies at War News

MACHINE tool dealers at Pittsburgh express the belief that the breaking of diplomatic relations with Germany will create a tremendous demand for machinery for the manufacture of munitions and war material and for the building of ships in this country. It is too early to say what will be the immediate effects of the situation, but it is known that several equipment dealers already are preparing for an exceedingly heavy demand for all kinds of tools needed for the manufacture of munitions. From a purely domestic standpoint, the market reflects unusual strength. The Westinghouse Electric & Mfg. Co., East Pittsburgh, which has awarded contracts for the erection of machine and forge shops and a large power house, at Essington, Pa., shortly will close for necessary machinery. The United States Steel Casting Co., which has purchased properties of the National Steel Casting Co., New Cumberland, W. Va.,



STEEL FOR GEARS

If your are a MAKER of Gears you will find that AGATHON STEELS will add to the excellency and reliability of your products, thus strengthening your reputation.

If you are a USER of Gears you will find that much greater service can be obtained from "AGATHON" quality Gears—for AGATHON STEELS are specially prepared for gear conditions.

We also make AGATHON STEELS for ***axles, springs, connecting rods, crank shafts, pistons, cams,*** etc.

Let us know your requirements.

AGATHON STEELS

"AGATHON" Chrome Nickel
"AGATHON" Chrome Steel
"AGATHON" Chrome Vanadium
"AGATHON" Nickel Steels
"AGATHON" Special Analyses
"AGATHON" Vanadium
"AGATHON" High Carbon

THE CENTRAL STEEL COMPANY

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BRANCH OFFICES

Detroit Office: 326-27-28 Ford Building, F. Walter Guibert, District Representative
Cleveland Office: Hickox Building, The Hamill-Hickox Co., District Representative
Chicago Office: Room 1511-12 Lytton Building, 14 East Jackson Blvd., A. Schaeffer, District Representative
Philadelphia Office: 902 Widener Building, Frank Wallace, District Representative
J. E. Dockendorff & Co., 20 Broad St., New York, N. Y., General Export Agents

plans to build a chain of foundries and machine shops in West Virginia.

Numerous Inquiries in Cleveland Market

WHETHER the international crisis is responsible for the activity of the Cleveland machine tool market or not, local dealers are having their hands full in meeting the heavy demand for equipment of a varied nature. One representative of a large eastern builder flatly refuses to accept further orders for machines. During the last week orders for more than $2,000,000 worth of equipment were placed with this one concern. Prices have again been raised. Power hammers have advanced 10 per cent, effective Feb. 1; planers, boring mills, radial drills, railroad and ship yard equipment have advanced from 10 to 25 per cent, effective Feb. 1. Deliveries are tightening; milling machines, shapers and lathes are subject to 20 or 30-day shipping dates. One builder of heavy boring mills cannot supply certain types of machines in less than 15 months and the maximum time required for other machines is 24 months. A number of good inquiries have appeared in the Cleveland market. The Ashtabula Bow Socket Co., Ashtabula, O., is in the market for a shaper. The Sidney Tool Co., Sidney, O., is in the market for a milling machine. The Adams Truck, Foundry & Machine Co., Findlay, O., is in the market for 15 machine tools, including some heavy equipment. The Kelly-Springfield Tire Co., Akron, has not yet closed for all the equipment for which it inquired last week. The Goodyear Tire & Rubber Co., Akron, O., is understood to be purchasing some additional shop equipment. The Ackerman Wheel Co., 541 Rockefeller building, Cleveland, is still in the market for some miscellaneous tools.

Cincinnati Builders Busy

INQUIRY for machine tools in Cincinnati during the past week has been better than in any similar period this year. Purchases are being made principally by users within a radius of several hundred miles, and preference is being given those builders who can guarantee early shipments. Deliveries are much better than at this time last year, and several makers, such as the National Lathe Co., can make deliveries of lathes within a week or 10 days after orders have been placed. The Peters Cartridge Co., Kings Mills, O., will buy additional equipment for several additions to its plant. The Champion Tool Works Co., the Cincinnati Bickford Tool Co., the Cincinnati Planer Co., and the Acme Machine Tool Co. are all buying machine tools of all descriptions for new plants and additions. Power plant equipment to the extent of $12,000 will be purchased soon by commissioners of Preble and Montgomery countries. The Norwood Sash & Door Co., Norwood, O., is in the market for additional power plant equipment.

Among New England Factories

BATH, ME.—Hyde Windlass Co. has let a contract for the erection of a machine shop extension and a new office building.

PORTSMOUTH, N. H. — Rockingham County Light & Power Co. has plans in progress for a $200,000 power plant extension.

BOSTON.—Edison Electric Illuminating Co. will erect a 44 x 103-foot substation.

BOSTON.—The pattern room and blacksmith shop of the Walworth Mfg. Co. in South Boston were damaged to the extent of $12,000 by fire.

BOSTON.—The Woman's Board of Trade Building, Inc., will build a brick and stone, 12-story building, to cost $650,000 at 468-472 Boylston street.

BOSTON.—The General Real Estate Trust will build a brick, 6-story, 50 x 150-foot business block to cost $60,000 at 23-29 Portland street.

BOSTON. — The Industrial Laboratories Corporation has been incorporated to manufacture thermostats with $450,000 capital by Robert Cushman, president; Charles D. Woodberry, treasurer and S. B. Montgomery.

BOSTON.—The Resilia Co. has been incorporated to manufacture metal devices with $200,000 capital by Frank D. Wilde, president; Oliver E. Chapman, Sharon, Mass., treasurer and M. E. Zink.

BROOKLINE, MASS.—The Cadillac Auto Co. will build a terra cotta, reinforced concrete, fireproof, 4-story and basement, 70 x 268-foot, with an ell 70 x 234-foot building on Commonwealth avenue.

CAMBRIDGE, MASS.—The Carr Factory Trust Co., Boston, has let contract for a reinforced concrete, 5-story, 46 x 110-foot factory building to cost $50,000 at 31 Ames street.

CHARLESTOWN, MASS. — Sanford Bray will erect a 1-story, 29 x 50-foot blacksmith shop here.

CHELSEA, MASS.—Weiner & Simmonds, Boston, will build a brick and concrete 2-story, 100 x 136-foot building to cost $90,000 at Cross, Park and Pearl streets.

GARDNER, MASS.—The Central Oil & Gas Stove Co. will build three brick, 3-story, 60 x 177-foot, 60 x 105-foot and 60 x 97-foot buildings.

HOLYOKE, MASS. — The McAuclan & Wakelin Co. will build a brick, 8-story, 90 x 98-foot business block at 239 High street.

HOPEDALE, MASS.—The Draper Corporation has let contract to the Casper Ranger Construction Co., Holyoke, Mass., for a brick, 4-story, 70 x 101-foot carpenter shop to cost $40,000.

HUDSON, MASS.—Work has been started on a brick, mill construction, 3-story, 40 x 60-foot addition to the factory of the Universal Boring Machine Co.

LOWELL, MASS.—Bids are in for a brick, mill construction, 1-story, 125 x 168 x 170-foot addition to the foundry of the Saco-Lowell shops on Dutton street.

LYNN, MASS. — Plans are being figured for a brick 2-story building to cost $30,000 for the Lynn Fire & Police Notification Co. on Mt. Vernon street.

MARBLEHEAD, MASS.—Burgess Co. has let a contract for the erection of a 1-story, 100 x 300-foot manufacturing building.

MIDDLEBORO, MASS. — The Colonial Brass Co. has purchased an 85 x 150-foot lot and contemplates erecting a factory.

NEW BEDFORD, MASS. — Continental Wood Screw Co. has let a contract for the erection of a 2-story and basement, 40 x 260-foot mill building.

NEW BEDFORD, MASS.—The finishing and drying department of the Taunton-New Bedford Copper Mfg. Co.'s plant was damaged by fire with a loss of $200,000.

SALEM, MASS.—Armour & Co. will erect a boiler room here.

SOMERVILLE, MASS. — American Tube Works has begun erecting a 1-story, 138 x 144-foot drawing mill.

SPRINGFIELD, MASS.—The Baker-Whittle Co. has been incorporated to make power vehicles with $30,000 capital by Lester H. Baker, treasurer and Lester Perrine, clerk.

TAUNTON, MASS.—Connecticut Mills Co. Danielson, Conn., is about to erect a 3-story and basement addition to its plant here.

TAUNTON, MASS.—The Poole Silver Co. is commencing work on the erection of a 3-story, 50 x 60-foot addition.

WORCESTER, MASS. — The American Steel & Wire Co. has purchased 31 acres of land, Hilton pond, a shoddy mill and water privileges in Auburn, Mass., and will construct a concrete reservoir to hold the water for use at its south works when needed.

BENNINGTON, VT. — Bennington Scales Co. has plans in abeyance for a 2-story, 40 x 60-foot plant addition.

BURLINGTON, VT.—Rutland Railroad Co. has completed plans for a new roundhouse to be located here.

BRIDGEPORT, CONN.—The Blue Ribbon Body Co. has been incorporated to do a manufacturing business with $500,000 capital by E. A. Godfrey, George H. Woods and S. J. Godfrey.

DERBY, CONN. — The General Ordnance Co. has plans for enlarging its plant at an expense of about $100,000.

HARTFORD, CONN.—The National Iron Works has purchased land on Windsor street and will erect a steel, 75 x 125-foot building to cost $50,000.

HARTFORD, CONN.—Bids have closed for a brick, mill construction, 4-story, 50 x 340-foot and a 1-story, 64 x 64-foot factory build-

Physical Structure Coarse

High in Manganese

Very desirable for making Basic Iron

Complete Analysis

	Dried 212°	Natural
Iron	58.35	50.2451
Phosphorus	.065	.05597
Silica	6.03	5.1924
Manganese	1.00	.8611
Alumina	3.40	2.9277
Lime	.16	.1377
Magnesia	.12	.1033
Sulphur	.031	.0266
Volatile Matter	5.74	4.9427
Moisture	13.89	

GUARANTEE for 1917

Iron, Natural 51.50

Crawford Ore is in demand because its coarse structure insures that it will work well in the furnace mixture.

IRON ORE

from our Open Pit Mines

CRAWFORD ORE

Mesaba Non Bessemer

This is the ore that experienced furnace managers prefer.

THE TOD-STAMBAUGH COMPANY

Perry-Payne Building - - CLEVELAND, OHIO

ing for the Underwood Computing Machine Co. on Arbor street.

MIDDLETOWN, CONN. — The Franklin Electric Mfg. Co. has purchased additional land and eventually may remove its Hartford branch here. The company has another branch in Pittsburgh, Pa.

NEW BRITAIN, CONN.—The Vulcan Iron Works has let contract for a 1-story, 40 x 50-foot addition to its plant on John street.

NEW HAVEN, CONN.—F. D. Cashin, 391 Chapel street, is about to erect a 1-story, 50 x 130-foot manufacturing building.

NEW HAVEN, CONN.—New England Machinery Co. has let a contract for the erection of a 1-story, 90 x 200-foot machine shop addition.

NEW LONDON, CONN.—The New London Ship & Engine Co. will start work shortly on a brick and steel, 1-story, forge shop.

STAFFORD SPRINGS, CONN.—Smith & Cooley will build a brick, mill-construction, 3-story, 40 x 60-foot mill to replace that recently burned.

STAMFORD, CONN.—The H. & H. Foundry Co. has been incorporated with $20,000 capital by Benjamin Harris, John Hansen, East Port Chester and C. P. Webb.

WATERBURY, CONN.—The Lux Clock Mfg. Co. has been incorporated with $50,000 capital, by P., H. and E. Lux.

WOONSOCKET, R. I.—Fire caused $35,000 damage to the plant of the Shambow Shuttle Co. on North Main street.

Along the Middle Atlantic Seaboard

NEW YORK. — The Universal Conveying Machinery Corporation has been incorporated with $1,500,000 capital by L. B. Case, A. F. Upson and P. Crichton, 120 Broadway.

NEW YORK.—The plant of the Manhattan Brass Co., 328 East Twenty-eighth street, suffered severe damage by fire last week. The loss of equipment and patterns was covered by insurance.

NEW YORK.—The Phelps Boiler Corporation has been incorporated with $50,000 capital to manufacture boilers and heaters by D. J. Dowling, C. S. Ashley and H. J. Neuschafer, 1515 Woodhaven avenue, Queens.

NEW YORK.—Comstedt & Co. have been incorporated with $100,000 capital as iron and steel workers, by G. L. Robinson, W. H. Waddington and J. T. A. Comstedt, 120 Broadway.

NEW YORK.—The Tank Equipment Co. has been incorporated with $10,000 capital to manufacture tanks, sprinklers, foundry and factory supplies, by G. H. Rowe Jr., W. E. Winne and M. Friedman, 112 West 118th street.

BAYONNE, N. J.—Tidewater Oil Co. is taking bids on the contract for a new boiler house.

CAMDEN, N. J. — The Wilckes-Martin-Wilckes Co. has been incorporated with $500,000 capital as chemist, by F. Wilckes, New York; F. Wilckes, Passaic, and L. Martin, West Orange.

CLAREMONT, N. J.—Standard Oil Co. has let a contract for the erection of three manufacturing buildings here.

ELIZABETH, N. J. — Standard Electric Fixture Co., Bridgeport, Conn., will shortly award contracts for the erection of a 4-story fireproof factory building on Elizabeth avenue. The structure will be 100 x 300 feet and will cost about $100,000.

GARWOOD, N. J.—National Boiler Co. will erect two additions to its plant to cost $15,000.

JERSEY CITY, N. J.—Shaper Elevator Co. has been incorporated to build elevators, etc., with $75,000 capital, by F. D. Shaper, Newark; Adam Steer, New York; Philip Halpen, Kearney.

McAFEE, N. J.—The Bethlehem Steel Co. will erect a power station and coal trestle, steel and concrete, 38 x 75 feet.

NEWARK, N. J. — Bigelow Construction Co. will erect a 4-story, 56 x 93, factory building at 292 Jeliff avenue to cost $40,000.

NEWARK, N. J.—Hagerstrom & Chapman, 9 Orchard street, will erect a 2-story brick factory to cost $10,000.

NEWARK, N. J.—Butterworth-Judson Co. will build two one-story steel buildings and a steel shelter oven to cost $18,000.

BEAVER FALLS, PA.—The plant of the Darlington Steel Casting Co. was damaged to the extent of $50,000 by fire.

BROWNSTOWN, PA.—The Pennsylvania railroad plans to replace the present steel bridge over tracks with a new one, and will construct a 6-foot span bridge at Branch street.

COATESVILLE, PA.—The Worth Steel Co. has been incorporated with $2,500,000 capital to manufacture steel by J. S., W. P., E. H. and W. A. Worth and N. L. Entrekin. It is building a plant at Claymont, Del.

CORRY, PA.—The Kurtz Brass Bed Co. plans to build an addition to its plant.

ELLWOOD CITY, PA. — The Standard Engineering Works plans to improve and enlarge its plant, to cost about $50,000. J. W. Hubbard, Pittsburgh, is manager of the company.

ERIE, PA.—The G. H. Williams Co. has been incorporated with $100,000 capital, to manufacture derricks, etc., by C. C. and L. A. Williams and G. J. Grierson.

FRANKLIN, PA.—Venango county plans to construct a bridge over Parklin run.

GREENSBURG, PA.—Westmoreland county, Loyalhanna township, plans to construct a bridge over Gettys run.

JOHNSTOWN, PA.—St. John's Reformed church, Somerset and Dibert streets, plans to enlarge its edifice, to cost about $18,000.

JOHNSTOWN, PA.—The Johnstown Chemical Co. has purchased a site on Levergood street at $16,000, and will erect a temporary building, 35 x 100 feet. The company also plans to erect a 3-story brick and steel building.

LANCASTER, PA.—New Process Steel Co. has let a contract for the erection of a 1-story, 37 x 84-foot mill building.

MYERSDALE, PA.—The Myersdale Handle Co. has been incorporated with $15,000 capital to manufacture tools and tool handles of metal and wood; by H. B. Snider, Jonas H. Lenhart, W. H. Dill, George Logue, J. M. Schlicht and Frank W. Layton.

PHILADELPHIA. — The William Adams Iron Foundry was damaged to the extent of $20,000 by fire recently.

PHILADELPHIA. — Tinius Olsen Testing Machine Co. has let a contract for the erection of a 5-story, 42 x 81-foot manufacturing building.

WEST CONSHOHOCKEN, PA.—The county plans to construct a bridge over the Schuylkill river, to cost about $250,000.

WHEATLAND, PA.—The Knox Pressed & Welded Steel Co. will double the capacity of its plant at Wheatland. It has awarded contracts for a building 110 x 500 feet, which it expects to be ready for operation in about five months.

BALTIMORE.—Western Maryland railroad has plans in progress for building a $150,000 roundhouse here.

SALISBURY, MD.—Jackson Dutman & Lane's Shirt Factory was damaged by fire to the extent of $140,000. William Jackson, president of the company, states that a larger factory will be erected immediately.

Activities in the Central States

BUFFALO.—Jacob Dold Packing Co. shortly will erect a 3-story, 27 x 130-foot engine room.

BUFFALO.—The Wright-Hibbard Industrial Electric Truck Co. has been incorporated with $300,000 capital, by R. F. Hibbard, G. A. and W. H. Wright, 48 South Division street.

BUFFALO. — The Sterling Steel Foundry Co., 33 Morris street, plans to erect a 1-story addition to its plant, to cost about $15,000.

BUFFALO.—The Delaware, Lackawanna & Western railroad plans to erect a train shed, 135 x 675 feet, to cost about $157,000. G. J. Ray, Hoboken, N. J., is chief engineer in charge of the work.

ONEIDA, N. Y.—The Dodge Steel Pulley Corporation has been incorporated to manufacture cast steel, structural and malleable articles by C. F. Morse, M. W. Mix and W. A. Mackenzie, Syracuse.

ROCHESTER, N. Y.—The state hospital commission plans to erect an addition to the Rochester State hospital. S. E. Elwood is secretary of the state hospital commission.

ROCHESTER, N. Y.—The board of supervision, Monroe county, has purchased a site in Franklin street, where it plans to erect a courthouse.

SYRACUSE, N. Y.—The Merrick Roller-Bearing Co. has been incorporated with $25,000 capital by L. M. Brimmer, E. L. Mooney and A. L. Merrick, 249 South avenue.

TROY, N. Y.—The Rensselaer Polytechnic Institute plans to build a wireless station, to cost about $11,000.

UTICA, N. Y.—City plans to construct an artificial lake in Nail Creek, South of Pleasant street, and will construct a bridge over same, to cost about $49,000.

WATERTOWN, N. Y.—The Northern New York Utilities, Inc., plans to erect a 5-story office building on Franklin street, to cost about $75,000. D. D. Kief is preparing the plans.

PITTSBURGH. — The Mine Safety Appliance Corporation has been incorporated with $100,000 capital by G. H. Deike, J. T. Ryan and H. D. Mason Jr.

PITTSBURGH.—The Pittsburgh Brewing Co., Oliver building, plans to erect a 3-

story addition to its stockhouse on Vinal street, to cost about $33,000.

PITTSBURGH.—The Topping Motor Truck & Machinery Co. has been incorporated with $25,000 capital, by Charles T. Topping, John Pfeil and Oscar Wilson, all of Pittsburgh.

PITTSBURGH.—The Tech Mfg. Co. has been incorporated with $10,000 capital to manufacture electrical and mechanical specialties; by A. H. Leser, 5331 Reeler street, Pittsburgh; B. Zabel, 174 Lloyd avenue, and M. W. Stoner, Maple Lane, Edgewood, Pa.

CANTON, O.—The Canton Storage & Transfer Co., according to W. E. Klotz, president, will make extensive improvements in the spring.

CANTON, O.—H. G. Bow, of the Canton Metal Products Co., states that contracts for the erection of the company's proposed factory building will be let early in February. Contracts for machinery and equipment are being awarded at the present time.

CINCINNATI.—The Sterling Machine Tool Co. has been incorporated with $10,000 capital by C. H. Norton, W. F. Trotter, F. E. Flynn and A. H. Norton.

CINCINNATI. — The Edna Brass Works soon will receive estimates on the construction of a 2-story and basement fireproof building. Plans are being prepared by the Alliance Engineering Co. The building will be 90 x 130-feet and will be used as machine shop and stock room.

CLEVELAND.—The plant of the Robertson Paint & Varnish Co. was damaged to the extent of $50,000 by fire recently.

CLEVELAND.—The Prospect Auto Top & Painting Co. plans to erect a $20,000, 1-story, 87 x 187-foot factory.

CLEVELAND.—The Lincoln Electric Co. has purchased a 70 x 148-foot site adjacent to its plant on which it plans to erect an addition.

CLEVELAND.—The K. M. Brass & Aluminum Casting Co. has purchased 6½ acres on the Erie railroad on which it plans to erect a factory building to cost $100,000.

CLEVELAND.—Architects Hubbell & Benes have filed plans with the building inspector for the new Masonic Temple to be erected at 3515 Euclid avenue and to cost $500,000.

CLEVELAND. — The Newburgh & South Shore railroad has been granted a permit to erect a $12,000 coaling station on East Seventy-first street.

CLEVELAND.—The Schwander Brass Mfg. Co. has been incorporated with $40,000 capital by J. S. Kohn, L. J. Kohn, F. H. Farahey, L. O. Landsman and L. M. Young.

CLEVELAND.—The Miles Heating & Ventilating Co. has been incorporated with $25,000 capital by J. C. Miles, J. W. Cornelius, C. M. Miles, et al.

CLEVELAND.—The Briggs Mfg. Co. plans to erect a 96 x 204-foot, 4-story, $90,000 addition to its plant. The general contract has been awarded to the Hunkin-Conkey Construction Co., Cuyahoga building.

CLEVELAND. — Engineer Robert Russell, 600 Schofield building, will be ready for bids about Feb. 1, on a storage building to be erected on Berea road for the American Sewer Pipe Co. The building will be 1-story, 40 x 120 feet, and will cost $8,000.

CLEVELAND. — The Wigmore Coliseum has been leased by E. M. Wills, president of the Euclid Square Garage Co., who plans to remodel it into a garage with a capacity for 3,000 machines. An expenditure of $100,000 is contemplated.

COLUMBUS, O.—Plans for the new Ohio penitentiary to be located on the farm purchased by the state near London, O., are on file in the governor's office.

DAYTON, O.—The Seybold Machine Co. plans to make extensive additions to its plant in the near future.

DAYTON, O.—The Spartan Mfg. Co. has been incorporated with $10,000 capital by H. J. Weisman, S. L., B. C. and J. P. Finn, and J. L. Kassoff.

DAYTON, O.—The American Railways Equipment Co. will erect a $100,000 car register plant in this city. Offices in charge of D. B. Wistler have been opened at 1165 Reibold building.

DELPHOS, O.—The Delphos Electric Light & Power Plant, owned by Hooper, Kimball & Williams, Boston, plans to make improvements to cost $100,000. A concrete substation, 45 miles of new wire, line equipment and a coal-conveying system are among the improvements planned.

FREMONT, O.—The Fremont Mfg. Co. has been incorporated with $20,000 capital to manufacture tools designed for the plumbing trade. A. F. Bacon, of Fremont, is interested.

SANDUSKY, O.—Eastern interests have secured options on the Lake Erie Dry Dock & Mill Co. and the Ohio Motor Co. The new concern proposes to improve the water front with slips and docks. The plant of the Ohio Motor Co. will be used for the construction of engines to be used in new boats constructed here.

TOLEDO, O.—The Taylor Coupler & Steel Castings Co. has been incorporated with $100,000 capital by J. C. Taylor and L. S. Dukes.

TOLEDO, O. — The Simplex Engineering Co. has been incorporated with $24,000 capital by H. J. Middleton, et al.

WAPAKONETA, O.—The New Wapakoneta Wheel Co. has acquired the Pineo & Daniels Wheel Co., Dayton, O., and is planning extensive improvements to its plant in this city.

BLUEFIELD, W. VA.—Armature Co. has plans in progress for a 1-story and basement, 60 x 100-foot manufacturing building.

WHEELING, W. VA.—The Craft Mfg. Co. has completed plans for extensive improvements to its plant.

LOUISVILLE, KY.—C. H. Moores, president of the Warehouse Architectural & Engineers' Co., Chicago, announces the company in the early spring will begin construction of a reinforced concrete terminal warehouse at Louisville to cost $2,500,000. It will be equipped with electrically-operated devices, and will have power lofts which will be leased to manufacturing concerns.

ANDERSON, IND.—M. G. Reynolds, who recently bought the plant of the American Safe & Lock Co. at receiver's sale, has announced it will be placed in operation.

BROOKVILLE, IND.—Bids will be received until March 5 by Charles G. Reifel, county auditor, for a steel bridge over White river.

ELKHART, IND.—The Loshbaugh & Jordan Tool & Machine Co. is planning to erect a new 1-story plant 80 x 200 feet. Additional equipment will be purchased.

FT. WAYNE.—The Brass Foundry & Machine Co. is planning to build a gray iron foundry 150 x 250 feet.

FT. WAYNE, IND.—Bids will be received until Feb. 8 by commissioners of Allen county for a 3-span concrete arch bridge to cost $75,000. A. W. Grosvenor is engineer.

JEFFERSONVILLE, IND.—The formation of a $35,000 corporation to build and operate a railroad from the Howard ship yards to terminals connecting with three railroads has been announced here. H. E. Heaton, J. Hamilton Duffin, and J. H. Baldwin are among the incorporators.

RICHMOND, IND. — The National Automatic Tool Co. will build a further addition.

TERRE HAUTE, IND. — The Standard Wheel Co. will build a 1-story addition, 104 x 164 feet.

BELLEVILLE, ILL.—The Belleville Enameling Works has been incorporated with $12,000 capital by E. A. Settler, Wilbur E. Klebs and H. A. Lengfelder.

BUSHNELL, ILL.—The George G. Bayne Co., manufacturer of automobile specialties, will build a factory 96 x 126 feet, costing $75,000.

CHICAGO.—The Wisconsin Steel Co. has purchased a 470 x 927-foot site to be used for an extension of its works.

CHICAGO.—John A. Taggart, architect, 167 North Clark street, is making plans for a 9-story hotel, 56 x 102 feet.

CHICAGO.—The R. M. Eddy Foundry Co., 372 West Grand avenue, has increased its capital from $150,000 to $200,000.

CHICAGO.—The board of public works will ask bids soon for a bascule bridge at Franklin and Orleans streets.

CHICAGO.—The Bell & Howell Co., manufacturer of motion picture machinery, is building an addition to cost $15,000.

CHICAGO.—The Fruin Drop Forge Co., 347 Root street, will build a 1-story addition, 24 x 60 feet.

CHICAGO.—Wells Fargo & Co., express, 30 North Dearborn street, will build a 10-story warehouse and garage.

CHICAGO.—The Link Belt Co. is building a machine shop and storage house, 125 x 175 feet, to cost $150,000.

CHICAGO.—The National Bag & Metal Co., Max Goodman, president, 5300 South Federal street, will build a 3-story warehouse 30 x 100 feet.

CHICAGO.—The Cullen Feisstedt Co., 7 South Dearborn street, plans a machine shop and storage building on Twelfth street in Cicero.

CHICAGO.—The Peter Schoenhofen Brew-

Do You Know That:

The West Bend Aluminum Co., West Bend, Wis., has purchased 17 acres adjoining its plant which will be devoted to the use of its employes as a recreation spot until it is needed for plant extension. The company is erecting an addition at the present time which, however, will not encroach upon the park.

* * *

Negotiations are being completed by the Pittsburgh Steel Co. to take over the plant of the Chatham Bridge Co., Chatham, Ont. The Pittsburgh concern plans to assume all business of the bridge company.

* * *

The Brenckle-Anger Co., Milwaukee, manufacturer of locks, hinges, etc., has changed its corporate style to the Atlas Metal Parts Co.

* * *

The Olson Mfg. Co. has been incorporated to make screws and other metal goods with $25,000 capital. R. C. Olson is president of the new concern, which succeeds a firm of the same name.

ing Co. has bought a site at Canal and Sixteenth street, adjoining its plant and will build an addition.

CHICAGO.—The Donahue Steel Products Co., 122 South Michigan avenue, has been incorporated with $10,000 capital by N. Amick, S. E. Hurley and M. S. Beakey.

CHICAGO.—The Zenith Mfg. Co. has been incorporated with $10,000 capital by Joseph R. Churan, John S. Hagberg and John J. Lupe, 155 North Clark street.

CHICAGO. — The Champion Foundry & Machine Co. has been incorporated with $40,000 capital by L. Kramer, A. E. Nelson and S. C. Larson.

CHICAGO.—The Chicago Metallic Packing Co. will build a 2-story factory, 60 x 125 feet, to cost $15,000. Walter Alschlager, 111 West Washington street, is architect.

CHICAGO.—The Elgin, Joliet & Eastern railroad plans to rebuild its bridge over the Grand Calumet river. A. Montzheimer, Joliet, is chief engineer.

CHICAGO.—The Automatic Screw Machine Products Co., 416 West Grand avenue, has plans nearly complete for a factory at Cicero, Illinois.

CHICAGO. — The Chicago Telephone Co., W. F. McGovern, engineer, 212 West Washington street, will take bids soon on a 16-story office building to cost $750,000.

CHICAGO.—The Drake Hotel Co., Michigan avenue and Seventh street, will take bids February or March on a 12-story hotel on the Lake Shore Drive, to cost $500,000.

CHICAGO.—The Imperial Brass Mfg. Co., Frank McNeillis, president, 524 South Racine avenue, will build a welding shop, 50 x 125 feet, to cost $12,000.

CHICAGO.—The Chicago Metallic Mfg. Co. has been incorporated with $25,000 capital by Albert A. Cohon, Louis Salinger and N. D. Cross.

CHICAGO.—The Doble Steam Car Co. of Illinois has been incorporated with $50,000 capital by A. F. Beckford, R. D. Morgan and Elmer W. Arch.

CHICAGO. — The International Harvester Co. of New Jersey, W. D. Price, engineer, is building a malleable foundry addition, 24 x 170 feet, at 1734 Fullerton avenue, at a cost of $3,500.

CHICAGO. — The Turner Mfg. Co. has bought a site at Ogden avenue and the Burlington railroad, and will build a plant at a cost of $150,000, including a large power installation.

CHICAGO.—Bids will be received about Feb. 15 by the commissioner of public works, 406 City Hall, on a double-leaf trunnion bridge at Clark street and Chicago river; estimated cost is $300,000.

CHICAGO.—C. A. Goodnow, assistant to the president of the Chicago, Milwaukee & St. Paul railroad, announces that electrification on the western line will be extended through the Cascade mountains.

CHICAGO.—The Chicago & Alton railroad, W. G. Bierd, president, 608 South Dearborn street, has plans nearly ready for its new freight terminal, 3 to 5 stories high, to cost $500,000.

CHICAGO.—Morris Wood & Co., manufacturers of tools, 5108 West Lake street, will build a 2-story addition, 43 x 60 feet, to cost $10,000. R. G. Pierce, 10 South LaSalle street, is architect.

CHICAGO.—The Ryan Car Co. has bought 50 acres additional at avenue O and 138th street in the village of Hegewisch. The company will erect a steel car building and repairing plant, costing $300,000 to $400,000.

CHICAGO.—Bids will be taken soon by R. E. Pingrey, 209 South LaSalle street, for a concrete, brick and steel power house, two stories, 80 x 200 feet, to cost $250,000, for the James S. Kirk Soap Co., 209 South LaSalle street.

CHICAGO.—The Acme Packing Co. has bought a site at Western avenue near Forty-third street and will improve it by a 2-story mill building with provision for two additional floors. Plans include erection of six other units each 75 x 115 feet, the total building expenditure to be $500,000.

CHICAGO.—The Diamond T Motor Co., 432 West Superior street, will occupy a new plant to be built by Peter S. Theurer at Twenty-sixth street and the Belt railroad. About $1,000,000 will be invested in the plant. C. A. Tilt is president and treasurer of the Motor company.

EAST ST. LOUIS, ILL.—The Aluminum Co. of America will build a reduction plant at East St. Louis. J. S. Murray, Oliver building, Pittsburgh, is purchasing agent.

GLADSTONE, ILL.—The board of fire and water commissioners is planning to install electric driven pumps of 100,000 gallons capacity and to build a 5-mile transmission line carrying 6,600 volts. J. R. Macklin is superintendent.

HARVEY, ILL. — The Buda Co., James Viles, president, 80 East Jackson boulevard, Chicago, will build a machine shop and assembling plant, 2 or 3 stories, 80 x 257 feet. Henry Doeder, 20 East Jackson boulevard, Chicago, is architect.

JOLIET.—The New Era Engineering Co. has increased its capital from $200,000 to $1,000,000 and has changed its name to the Elgin Motor Truck Co.

LA SALLE, ILL.—New pumps and improvements to the waterworks system, costing $150,000 are being planned by E. J. Byrne, city engineer.

MURPHYSBORO, ILL.—The Harrison Steel Co. will erect a $300,000 steel castings foundry. The project has the co-operation of the Murphysboro Commercial Association.

NORTH CHICAGO, ILL.—The North Chicago Foundry Co. has increased its capital stock from $40,000 to $50,000.

PARIS, ILL.—A truck and machine shop, 1-story, 146 x 162 feet, and to cost $18,000, will be built by the McGuire Cummins Co. Preliminary sketches are in charge of C. B. Biddesen, manager.

QUINCY, ILL.—The Electric Wheel Co. plans to make additions to its plant in the near future to cost about $50,000. It has planned to spend about $40,000 for new equipment. One extension will be 50 x 160 feet and the other 90 x 205 feet.

ROCK ISLAND, ILL.—The Wray Pneumatic Pump Co. has been incorporated to manufacture pneumatic pumps, with $21,000 capital, by James L. Wray, N. M. Moore and C. R. Chamberlain.

SPRINGFIELD, ILL. — Plans are rapidly nearing completion for a new plant for the Springfield Light, Heating & Power Co. Bids for the construction and equipment will be taken in a few days.

STERLING, ILL.—An election will be held soon on issuing $130,000 in bonds for a bridge over Rock river connecting Sterling and Rock Falls.

WAUKEGAN, ILL.—The Chicago Recording Scale Co. will build a 2-story machine shop 38 x 75 feet, to cost $6,000.

APPLETON, WIS.—The capital stock of the Valley Iron Works Co. has been increased from $60,000 to $200,000. The additional stock will be used in the regular course of business, but the plant probably will be enlarged during the present year. W. H. Burns is secretary.

BLOOMER, WIS.—The main building of the Bloomer Machine Works, which sold its business to the Keller gas engine interests at Eau Claire, Wis., several months ago, and discontinued manufacturing, has been leased by Oluf Enger, Chippewa Falls, Wis., who will open a commercial machine shop and machinery manufacturing business. Practically a complete new equipment will be installed.

BURLINGTON, WIS. — The Burlington Brass Works is having plans prepared for remodeling its entire drive from steam to electricity.

CHILTON, WIS. — Bids will be received until March 6 by A. J. Pfeffer, city clerk, for the construction of a municipal waterworks plant including a steel tank and tower, pumping station and equipment and distributing system.

CUDAHY, WIS.—The Federal Rubber Mfg. Co. is completing work on a 6-story factory building costing $200,000, and is preparing to undertake further additions to the rubber and tire plant.

HARTFORD, WIS. — The Hartford Iron Works has been organized by Louis Rosche and I. L. Bonniwell to establish a gray iron foundry.

MILWAUKEE.—The J. L. Kunz Machine Co. has reorganized as the Kunz Steel Co. with $100,000 capital and will specialize on sheet steel motor truck wheels.

MILWAUKEE.—Vaughn & Meyer, electrical engineers, Majestic building, are taking bids on a 200-kilowatt generator, switchboard, engine, etc., for the enlarged power plant of the Kempsmith Mfg. Co., milling machines, West Allis.

MILWAUKEE.—Henry C. Hengels, architect, First National Bank, Milwaukee, is preparing plans for a $50,000 dairy plant for the City Dairy at Muskegon, Mich. High pressure boilers, refrigerating system, electric elevator, etc., will be required.

MILWAUKEE. — James A. Hannan, 1125 Wells building, has engaged O. C. Uehling, architect and engineer, to prepare plans for a 7-story light manufacturing building, of the loft type, reinforced concrete and brick, on Milwaukee street. It will be 60 x 150 feet in size and cost about $275,000. The contract for reinforcing bars has been let to the J. P. Kallman Co., St. Paul and Milwaukee. Other will be taken about Feb. 15.

SHEBOYGAN, WIS.—Bids will be received soon by J. M. Steimlo, city clerk, on the Fourteenth street viaduct, steel and concrete, 600 feet long with 24-foot roadway, and a steel span 90 feet long, costing $50,000.

STURGEON BAY, WIS.—Waterworks improvements to cost $35,000 are being planned.

WEST ALLIS, WIS.—The board of education expects to be ready for bids immediately after Feb. 1 on the erection of the new West Allis high school at Sixty-seventh and National avenues, to cost approximately $150,000. The building will be 176 x 277 feet.

WEST BEND, WIS.—The LaPoint Foundry plans to build an 18 x 30-foot addition to its foundry.

WEST BEND, WIS.—A 2-story addition, 50 x 260 feet, is being planned by the West Bend Aluminum Co. for erection in the spring.

ALMA, MICH.—Plans are being prepared for improvements to the waterworks plant, including a pumping station, steel tank and stand-pipe, costing $60,000. E. A. Smith is engineer.

BENTON HARBOR, MICH.—The Chicago

Stove & Range Co. has been incorporated with $200,000 capital to manufacture stoves, furnaces and heating appliances, by Walter Widlar, J. E. Fitzgerald and H. A. Furber.

BUCHANAN, MICH.—Reported here city has been offered the manufacturing plant of the Campbell Transmission Co., a $250,000 Chicago concern. The city has been asked to subscribe one-half the capital of the company.

DETROIT.—The National Body & Trimmings Works is building an automobile factory to cost $50,000.

DETROIT.—Preliminary plans have been completed by Smith, Hinchman & Grylls, engineers, 710 Washington arcade, for a steel warehouse for Joseph T. Ryerson & Son, Chicago.

DETROIT. — The Detroit Gage & Metal Stamping Co. has been incorporated with $50,000 capital to manufacture auto accessories by O. S. Kelly, S. R. Livingstone and E. C. Lewis.

DETROIT.—The Detroit Automobile Clamp Co. has been incorporated to manufacture automobile and steel specialties with $40,000 capital by John W. Bryson, G. G. Collins and G. W. Whipple.

JACKSON, MICH.—The Edwards Corporation has been incorporated with $15,000 capital to manufacture auto parts and accessories, by H. E. and M. J. Edwards, Jackson, and G. B. Brink, Detroit.

LANSING, MICH.—The Gier Pressed Steel Co. has increased its capital from $500,000 to $1,000,000.

LANSING, MICH.—The Michigan Central railroad has acquired a city block and will erect a new freight house, lay storage tracks with a capacity of 740 cars, build a roundhouse with four stalls and a coal loading dock. The improvements will cost $500,000.

MINNEAPOLIS.—The B. J. Johnson Soap Co., W. C. Redlin, manager, 11 South Ninth street, will build a soap factory and warehouse, six stories, 60 x 165 feet, to cost $80,000.

SPRINGFIELD, MO.—The Ford Brass Co. has been incorporated with $10,000 capital by T. M. Ford, J. A. Gammon and H. T. Ford.

ST. LOUIS. — W. Maier, 3515 North Twenty-third street, will build a factory, 44 x 75 feet, to cost $5,000.

ST. LOUIS. — The Mauthe-Schaefer Mfg. Co. has been incorporated to manufacture machinery with $12,000 capital by William J. Mauthe, Henry B. Irwin, of De Soto, Mo., and Louis Schaefer, of St. Louis.

FT. DODGE, IA.—Bids will be received until Feb. 9 by J. L. Hanrahan, county auditor, for the construction of 35 bridges.

IOWA FALLS, IA. — The city of Iowa Falls plans the construction of waterworks extensions to cost $100,000.

NEWTON, IA.—E. J. Mills & Co., manufacturer of automobiles, will take bids soon on a 1-story machine shop costing about $10,000. Eckland, Fugard & Knapp, 111 West Monroe street, Chicago, are architects.

Western and Intermountain Territory

BESSEMER, N. D.—Plans are being completed for the erection of a new 40-ton shop by the Central Foundry Co.

ELDORADO, KAS.—An election will be held Feb. 13 on issuing $60,000 in bonds for a waterworks system. B. F. Alleback is city clerk.

BIG SANDY, MONT.—Bonds for $29,000 have been voted for waterworks construction.

BILLINGS, MONT.—Billings Traction Co., it is reported, is to be reorganized and that its street cars are to be changed from storage battery to trolley system, cost $200,000.

BUTTE, MONT.—The Simmons Co., of Kenosha, Wis., is planning to build a branch factory at Butte, at a cost of $40,000.

DILLON, MONT.—Bids will be received until March 7 by J. S. Baker, county clerk, for a 122-foot steel bridge over Beaverhead river.

HELENA, MONT.—Great Northern railroad will construct a branch from Poplar to Opheins. The company also contemplates electrifying lines in western Montana. The Northern Pacific railroad will construct a 38-mile line from Hesper to Gibson, a 40-mile line from Gibson to Polson and a branch from Dillon to Twin Bridges and from Willsall to Ringling. The Milwaukee will electrify 30 additional miles in this state.

KALISPELL, MONT.—Grant Smith & Co., Henry building, Seattle, have secured a contract to build 30 miles of railroad for the Great Northern near here.

LIVINGSTON, MONT.—Northern Light, Mining & Milling Co. contemplates construction of a 250-ton mill on Pine Creek. Ben C. Harmon is manager.

LAWTON, OKLA. — The Ozark-Canadian Bridge Co. has been incorporated with $70,000 capital to build a steel bridge over South Canadian river by C. W. Clift, N. H. Clift and others.

OKMULGEE, OKLA. — The United Iron Works plans to build a machine shop and boiler shop costing $5,000.

DELTA, UTAH.—The Delta Beet Sugar Corporation is making plans for a 3-story sugar factory, 66 x 300 feet, costing $1,000,000. Stearns, Rogers Co., 1720 California street, Denver, Colo., is architect.

POCATELLO, IDA.—Pocatello Traction & Interurban Co. has increased capital from $200,000 to $2,000,000 and proposes to spend $1,500,000 on new lines.

WALLACE, IDA.—Shoshone & Clearwater railroad has been incorporated to build 36 miles along Marble creek to connect with the main line of Milwaukee. Frederick Herrick and J. C. Palmer are among the incorporators, all of St. Maries, Idaho.

CORDOVA, ARK.—Copper River & Northwestern railroad, with this place as its tidewater terminus, and running 196 miles to Kennecott, will spend $1,000,000 in new work and equipment.

SPRINGDALE, ARK. — Plans are being prepared for rebuilding the powerhouse and transmission line of the Springdale Light & Power Co.

The Pacific Coast States

SEATTLE.—The Western Gear Works is building a 1 and 2-story plant to cost $10,000.

SEATTLE. — The Ames Ship Building & Dry Dock Co. is building a machine shop and furnace, blacksmith and coppersmith buildings.

SEATTLE.—The Marine Iron Works has been incorporated with $30,000 capital by P. C. Peterson, F. Batton and C. J. Erickson.

SEATTLE.—The National Ship Building Co., recently incorporated with $20,000 capital, has taken over the plant of Johnson Bros. & Blanchard and will add to its equipment.

SEATTLE.—Naval Architect L. H. Coolidge, 66 Marion street, has prepared plans for a ferryboat for the Kingston Transportation Co. to cost about $150,000 to operate between this place and Bremerton. Bids are to be asked soon.

TOPPENISH, WASH.—It is reported that the Oregon-Washington Railway & Navigation Co. will build a line from Granger to this place and from West to White Swan.

BEND, ORE. — It is reported that the Grand Rapids Furniture Co. will construct a 15-mile logging railroad in connection with a factory which it proposes to establish here.

OREGON CITY, ORE.—The Oregon City Foundry has been incorporated with $20,000 capital by Leslie V. Roake, John A. Roake and C. H. Roake.

BERKELEY, CAL.—The Macaulay Foundry Co. plans an addition to cost $40,000. H. C. Macaulay is president.

OAKLAND, CAL.—The East Bay Foundry Co. will build a 1-story plant costing $75,000. W. Cobb is president.

STOCKTON, CAL.—The Holt Mfg. Co. is planning a machine shop 100 x 300 feet, to cost $30,000.

VALLEJO, CAL.—Bids will be received until Feb. 26 by the bureau of yards and docks, navy department, Washington, D. C., for an extension of machine shop building No. 87, steel frame and reinforced concrete roof at the Mare Island navy yard.

New Catalog

TURRET LATHES.—Through the use of a profusely-illustrated catalog, the Acme Machine Tool Co., Cincinnati, has brought the attention of the machine tool trade to the wide line of flat turret lathes built by the Acme company. A plain photograph of a tool conveys little information to the average reader of technical trade publications, but a draftsman's conception of a lathe while necessarily not beautiful, certainly explains itself. The Acme company has used both the half tone illustration and the zinc etching in making up its catalog. A detailed description of the important features of each type of machine built by the Acme company accompanies each plate and this information is further supplemented by a quarter-page devoted to "Points of Merit" and a quarter-page of specifications. Collets, bushings, rings, tools of a wide range of types including box tools, and die holders are described with considerable detail and are accompanied by a number of photographs.

IRON AND STEEL PRICES

Corrected up to Tuesday noon

PIG IRON

Bessemer valley	$35.00
Bessemer, Pittsburgh	35.95
Basic, Pittsburgh	30.95
Basic, eastern Pa.	30.50 to 31.00
Basic, Buffalo	35.00
Malleable, Pittsburgh	33.95 to 35.95
Malleable foundry, Chicago	31.00
Malleable foundry, Philadelphia	34.00 to 35.00
Malleable foundry, Buffalo	35.00
No. 1X foundry, Philadelphia	32.00 to 32.50
No. 2 foundry, Pittsburgh	33.95 to 35.95
No. 2 foundry, Cleveland	30.30 to 31.30
No. 2 foundry, Ironton	30.00
No. 2 foundry, Chicago	31.00
No. 2X foundry, Philadelphia	31.00 to 32.00
No. 2X foundry, N. J. tidewater	31.00 to 32.00
No. 2X foundry, Buffalo	35.00
No. 2 plain, Philadelphia	30.50 to 31.00
No. 2 plain, N. J. tidewater	30.50 to 31.00
No. 2 plain, Buffalo	35.00
No. 2 southern, Birmingham	23.00 to 25.00
No. 2 southern, Cincinnati	25.90 to 27.90
No. 2 southern, Chicago	27.50 to 28.00
No. 2 southern, Phila. delivery	28.00 to 30.00
No. 2 southern, Cleveland	27.50 to 29.00
No. 2 southern, New York docks	28.25 to 30.25
No. 2 southern, Boston docks	28.00 to 30.00
No. 2 south. interior, New Eng.	29.00 to 31.00
No. 2 southern, St. Louis	
Virginia, No. 2X furnace	27.00 to 28.00
Virginia, No. 2X, Philadelphia	29.75 to 30.75
Virginia, No. 2X, Jersey City	30.00 to 31.00
Virginia, 2X, Boston points	30.25 to 31.25
Gray forge, eastern Pa.	29.50 to 30.00
Gray forge, Pittsburgh	30.95
Gray forge Birmingham	22.00
Silveries, 8 per cent, furnace	36.00 to 37.00
Silveries, 8 per cent, Chicago	38.50
Low phos. Standard, Phila.	56.00 to 58.00
Low phos. Lebanon, Pa., furnace	50.00 to 55.00
Low phos., Pittsburgh	52.00 to 54.00
Charcoal, Lake Superior, Chgo., Nos. 1 to 4	33.75 to 34.75
Charcoal, Buffalo	24.00 to 27.00
Charcoal, Birmingham	26.00 to 27.00

IRON ORE

Lake Superior Ores.	Lower Lake Ports.
Old range Bessemer, 55 per cent, ton	5.95
Messabi Bessemer, 55 per cent, ton	5.70
Old range non-Bes., 51½ per cent, ton	5.20
Mesabi non-Bess., 51½ per cent, ton	5.05

Port Henry Ores. Per unit delivered eastern Pa. All non-Bessemer.

Old Bed, crude, 58 per cent	10.50c to 11.00c
Old Bed, concent., 65 per cent.	11.00c to 11.50c
Harmony concent., 63 per cent.	11.50c to 11.75c
Lump (at mines)	$5.75

COKE

(At the ovens.)

Connellsville furnace	$8.75 to 9.50
Connellsville furnace, contract	8.00 to 8.25
Connellsville foundry, contract	6.50 to 6.75
Connellsville foundry	10.00 to 11.00
Wise county furnace, contract	8.00 to 8.50
Wise county foundry, contract	8.50 to 9.00
Pocahontas foundry, contract	8.50 to 9.00
Pocahontas furnace, contract	8.00 to 8.50
New River foundry, contract	9.00 to 11.00
New River furnace, contract	8.50 to 9.00

FERRO ALLOYS AND STEEL MAKING METALS

Ferro manganese, 80 per cent, furnace prompt	$250
Ferro manganese, 80 per cent, seaboard, or delivered, contract	164 to 200
Spiegel, 20 per cent, fur. early and last half	65.00
Ferro-silicon, 50 per cent, Pbgh.	150 to 175

Bessemer ferro-silicon, 9 per cent to 10 per cent, $41.00; 10 to 11 per cent, $42.00; 11 to 12 per cent, $43.00; 12 to 13 per cent, $44.00 a ton at the furnace at Ashland, Jackson and New Straitsville, O.

Ferro-carbon titanium, 8 to 12½ cents per pound in carloads.

SEMI-FINISHED MATERIAL

Open hearth billets, Phila.	$60.00 to 65.00
Forging billets, Phila.	75.00 to 85.00
Forging billets, Pbgh., nominal	75.00 to 85.00
Forging billets, Chicago	70.00
Wire rods, Pittsburgh	75.00 to 80.00
Bessemer billets, Youngstown	60.00 to 65.00
Bessemer billets, Pittsburgh	60.00 to 65.00
Open hearth billets, Pittsburgh	60.00 to 65.00
Open hearth billets, Youngstown	60.00 to 65.00
Bess. sheet bars, Youngstown	60.00 to 65.00
Op. h'th sheet bars, Youngstown	60.00 to 65.00
Bess. sheet bars, Pittsburgh	60.00 to 65.00
Open hearth sheet bars, Pbgh.	60.00 to 65.00
Muck bars, Pittsburgh (nominal)	50.00
Grooved steel skelp	3.00c to 3.10c
Sheared steel skelp	3.50c to 3.60c

RAILS AND TRACK MATERIAL

(Gross tons.)

Stand. Bes. rails, Pbgh. & Chgo.	$38.00
Stan. op-h'th rails, Pbgh. & Chgo.	40.00
Light rails, 8 to 10 lbs., Pbgh.	53.00
Light rails, 8 lb., Chicago	50.00
Light rails, 12 to 14 lbs., Pbgh.	52.00
Light rails, 12 lbs., Chicago	49.00
Light rails, 16 to 20 lbs., Pbgh.	51.00

Freight Rates, Pig Iron

Mahoning and Shenango valleys to:—	
Cleveland	$0.95
Newark, N. J.	2.98
Boston	3.18
Philadelphia	2.78
Pittsburgh	.95
St. Louis	3.18
Minneapolis, St. Paul	4.54
Buffalo to:—	
Albany, N. Y.	$1.26
New England (all rail)	2.58
New York and Brooklyn (all rail)	2.58
New York and Brooklyn (by canal)	1.25 to 1.60
Virginia furnaces to: —	
Boston docks (r. and w.)	$3.05
New England (all rail)	3.25
New York dock (r. and w.)	2.88
Birmingham, Ala., to:—	
Cincinnati	$2.90
Chicago	4.00
Cleveland	4.00
Louisville, Ky.	2.65
Minneapolis, St. Paul	5.85
New York (all rail)	6.15
New York (r. and w.)	4.25
Philadelphia (all rail)	5.20
Philadelphia (r. and w.)	4.00
Pittsburgh	4.90
Savannah, Ga.	2.75
Chicago to:—	
Des Moines	$2.80
Milwaukee	.50
Minneapolis, St. Paul	2.00
Moline, Ill.	1.40
Omaha	3.58
St. Louis	1.58
Ironton and Jackson, O., to:—	
Chicago	$2.54
Cincinnati	1.26
Cleveland	1.62
Detroit	1.81
Indianapolis	1.58
Minneapolis, St. Paul	4.54
Duluth, Minn., to:—	
Minneapolis-St. Paul	$1.25
Mayville, Wis.:—	
Minneapolis-St. Paul	$1.75

Light rails, 16 to 20 lbs., Chgo.	$48.00
Light rails, 25 to 45 lbs., Pbgh.	50.00
Light rails, 25 to 45 lbs., Chgo.	47.00
Relaying rails, standard, Pbgh. and Chicago	$33.00 to 34.00
Relaying rails light, Chicago	34.00 to 35.00
Angle bars, st. sect., Pbgh. base	2.25c to 2.75c
Angle bars st. sections, Chgo.	2.25c to 2.75c
Spikes, railroad, Pittsburgh	3.40c
Spikes, railroad, Chicago	3.50c
Track bolts, Pittsburgh	4.50c to 5.00c
Track bolts, Chicago	4.50c to 4.60c
Tie plates, Chicago	$55.00 to 60.00

SHAPES, PLATES AND BARS

Structural shapes, con. Pbgh.	3.25c
Structural shapes, Philadelphia	3.409c to 3.659c
Structural shapes, New York	3.419c to 3.669c
Structural shapes, Chicago	3.44c to 4.00c
Tank plates, Chicago	3.94c to 4.50c
Tank plates, Pittsburgh (con.)	3.75c to 4.00c
Tank plates, Philadelphia	3.909c to 4.909c
Tank plates, New York	3.919c to 4.919c
Bars, soft steel, Chicago	3.19c to 3.50c
Bars, soft steel, Pbgh. (con.)	3.00c
Bars, soft steel, Pittsburgh	3.00c to 3.25c
Bars, soft steel, New York	3.169c to 3.419c
Bars, soft steel, Philadelphia	3.159c to 3.409c
Hoops, carloads, Pbgh. contr.	3.50c
Hoops, Pbgh.	4.00c to 4.25c
Bands, Pittsburgh	3.90c to 4.10c
Bands, Pittsburgh (contr.)	3.00c
Shafting, Pbgh., contr. carloads	10 to 20 off
Bar iron, Chicago	3.00c
Bar iron, Philadelphia	3.159c
Bar iron, Cleveland	3.00c
Bar iron, New York	3.169c
Bar iron, Pittsburgh	3.25c
Hard steel bars, Chicago	3.00c

SHEETS

(In cents per pound.)

(Open hearth material takes 10c above prices of bessemer.)

SHEET MILL BLACK.

Gage.	Bessemer.
17 to 21	4.30 to 5.30
22 to 24	4.35 to 5.35
25 and 26	4.40 to 5.40
27	4.45 to 5.45
28	4.50 to 5.50
29	4.55 to 5.55
30	4.65 to 5.65

TIN MILL BLACK.

Gage.	Bessemer.
15 and 16	4.30 to 5.30
17 to 21	4.35 to 5.35
22 to 24	4.40 to 5.40
25 to 27	4.45 to 5.45
28	4.50 to 5.50
29 and 30	4.55 to 5.55
30½ and 31	4.60 to 5.60

GALVANIZED.

Gage.	Bessemer.
10 and 11	5.50 to 6.25
12 to 14	5.60 to 6.35
15 and 16	5.75 to 6.50
17 to 21	5.90 to 6.65
22 to 24	6.05 to 6.80
25 and 26	6.20 to 6.95
27	6.35 to 7.10
28	6.50 to 7.25
29	6.70 to 7.45
30	6.90 to 7.65

BLUE ANNEALED.

Gage.	Bessemer.
3 to 8	4.25 to 4.75
9 to 10	4.25 to 4.75
11 to 12	4.25 to 4.75
13 and 14	4.25 to 4.75
15 and 16	4.25 to 4.75

No. 28 black, Chicago	4.94c to 5.19c
No. 28 galvanized, Chicago	6.50c to 6.75c
No. 10 blue annealed, Phila.	4.659c to 5.159c
No. 10 blue annealed, Chicago.	4.69c to 4.94c

TIN PLATE

Tin plate, 100 lb., coke base	7.00c to 8.00c
Terne plate	5.75c

IRON AND STEEL PIPE

(Prices adopted Dec. 30, 1916.)

Steel.

Diameter in inches.	Black. Per cent off.	Galv. Per cent off.
⅛, ¼ and ⅜, butt	57	30½
½, butt	61	46½
¾ to 3, butt	64	50½
2, lap	57	44½
2½ to 6, lap	60	47½
7 to 12, lap	57	43½
13 and 14, lap	47½	....
15, lap	45	....

Iron.

Standard weight, threads and couplings, diam. in inches.	Black. Per cent off.	Galv. Per cent off.
⅛ and ¼, butt	46	19
⅜, butt	47	20
½, butt	51	33
¾ to 1½, butt	54	38
1¼, lap	40	25
1½, lap	46	32
2, lap	47	33
2½ to 6, lap	49	36
7 to 12, lap	48	35

BOILER TUBES

(Price adopted Nov. 20, 1916.)

Steel, 3½ to 4½ inches l. c. l.	46
Iron, 3½ to 4½ inches l. c. l.	36

IRON AND STEEL PRICES

Corrected up to Tuesday noon

WIRE PRODUCTS

(Adopted Nov. 24, 1916.)
(Retailers' prices 5 cents above jobbers' quotations.)

Wire nails, jobbers', Pittsburgh	$3.00
Coated nails	3.00 to 3.15
Plain wire, jobbers', Pittsburgh	2.95
Galvanized wire, jobbers', Pbgh	3.65
Polished staples, Pbgh	3.15
Galvanized staples, Pbgh	3.85
Barb wire, painted, jobbers', Pbgh.	3.15
Barb wire, galv., jobbers', Pbgh.	3.85

BOLTS AND NUTS

(Delivered within 20-cent freight radius.)

Carriage bolts, ⅜ x 6 inches, smaller or shorter, rolled thread, 40 and 10; cut threads, 40 and 2½, larger or longer, 30 and 5.

Machine bolts with hot pressed nuts ⅜ x 4 inches, smaller or shorter rolled 50; cut, 40 and 10; larger or longer, 35 and 5.

Cold pressed, semi-finished hexagon nuts, 50, 10 and 5.

Gimlet and cone point lag bolts, 50. Hot pressed square nuts, blanks, $2.50 off; tapped $2.30 off. Hot pressed hexagon nuts, blank, $2.50 off; tapped, $2.30 off.

Cold pressed square nuts, blank, $2.10 off; tapped, $1.90 off. Cold pressed hexagon nut, blank, $2.25 off; tapped, $2.00 off.

RIVETS

Structural rivets, Pbgh	4.25c
Boiler rivets, Pbgh	4.35c

Tinner's rivets, 40 and 10 off, Pittsburgh.

STEEL SHEET PILING

(Pittsburgh.)

Base sizes	3.00c

STANDARD STEEL CHAIN

Chain, ⅜ inch proof coil	6.00c

COLD ROLLED STRIP STEEL

Base price, 7.00c per 100 pounds, hard, coils 1½ inches and wider and by .100 inch and heavier.

CAST IRON WATER PIPE

Four-inch, Chicago	$44.50 to 45.50
Six-inch and larger, Chicago	41.50 to 42.50
Six-inch Class B, New York	41.50
Four-inch Class B, New York	44.50
Four to six-inch Birmingham	39.00
Six-inch and larger, Birmingham	36.00

Light weight water and gas pipe $1 per ton higher than standard water.

WAREHOUSE PRICES

Steel bars, Chicago	3.75c
Steel squares, 2-in. & ov., Cleve.	4.50c
Steel bars, und. 2 in., Cleveland	4.00c
Steel rounds, 2-in. & ov., Cleve.	4.50c
Steel bars, Detroit	3.70c
Steel bars, Philadelphia	3.75c
Steel bars, New York	4.00c
Steel bars, St. Louis	3.80c
Steel bars, Cincinnati	3.90c to 4.45c
Steel bars, St. Paul	3.85c
Steel bars, over 2-in., Buffalo	4.50c
Steel bars, Buffalo	3.85c
Iron bars, Chicago	3.75c
Iron bars, Cleveland	3.95c
Iron bars, Detroit	3.70c
Iron bars, St. Louis	3.75c
Iron bars, Cincinnati	3.80c to 4.35c
Iron bars, Philadelphia	3.70c to 3.75c
Iron bars, New York	3.75c to 3.85c
Shapes, Chicago	4.00c
Shapes, Detroit	3.90c
Shapes, St. Louis	4.05c
Shapes, St. Paul	4.10c
Shapes, New York	4.10c
Shapes, Cleveland	4.10c
Shapes, Philadelphia	3.75c
Shapes, Buffalo	3.95c
Shapes and plates, Cincinnati	4.10c to 4.75c
Plates, Chicago	4.65c
Plates, Detroit	4.75c
Plates, St. Louis	4.70c
Plates, St. Paul	4.75c
Plates, New York, wide	5.00c
Plates, New York, narrow	5.15c
Plates, Cleveland	4.75c
Plates, Philadelphia	4.50c to 5.00c
No. 10 blue anl. sheets, Chicago	5.00c
No. 10 blue anl. sheets, Clevel'd	5.00c
No. 10 blue anl. sheets, Buffalo	4.50c
No. 10 blue anl. sheets, St. L.	5.05c
No. 10 blue anl. sheets, Cinci.	5.00c
No. 10 blue anl. sheets, St. Paul	5.10c
No. 10 blue anl. sheets, Detroit	4.75c
No. 28 black sheets, Chicago	5.15c
No. 28 black sheets, Cleveland	5.50c
No. 28 black sheets, Cincinnati	5.25c
No. 28 black sheets, Detroit	5.25c
Hoops, Detroit	4.50c
No. 28 black sheets, St. Louis	5.30c
No. 28 black sheets, St. Paul	5.25c
No. 28 galv. sheets, Chicago	7.00c
No. 28 galv. sheets, Cleveland	7.00c
No. 28 galv. sheets, Cincinnati	7.50c
No. 28 galv. sheets, Detroit	7.25c
No. 28 galv. sheets, St. Louis	7.50c
Hoops, Cleveland	5.00c

Coke Oven By-Products

Spot.

Per Gallon at Producers Plant.

Pure benzol	$0.55 to .60
Toluol	1.75 to 2.00
Solvent naphtha	.25

Per Pound at Producers Plant.

Phenol	$0.50 to .55

Per 100 Pounds at Seaboard.

Sulphate of ammonia	$4.18 to 4.20

Contract.

Per Gallon at Producers Plant.

Pure benzol	$0.55 to .60
Toluol	1.50 to 1.75
Solvent naphtha	.25

Per Pound at Producers Plant.

Phenol (nominal)	$0.50 to .55

Per 100 Pounds at Seaboard.

Sulphate of ammonia	no market

IRON AND STEEL SCRAP

(Net Tons.)

Angle bars, iron, Chicago	$26.50 to 27.00
Angle bars, steel, St. Louis	18.50 to 19.00
Arch bars and transoms, St. L.	28.00 to 28.50
Arch bars and transoms, Chgo.	27.50 to 28.00
Cast, No. 1, St. Louis	15.00 to 15.50
Boiler plate, cut, No. 1, Chgo.	13.00 to 13.50
Boiler plate, cut, No. 1, St. L.	13.00 to 13.50
Boiler punchings, Chicago	20.00 to 21.00
Bundled sheet, Cincinnati	12.50 to 13.00
Busheling, No. 1, Chicago	16.50 to 17.00
Busheling, No. 1, Cincinnati	14.00 to 14.50
Busheling, No. 1, Cleveland	17.50 to 18.00
Busheling, No. 1, St. Louis	16.50 to 17.00
Busheling, No. 2, Chicago	12.25 to 12.75
Cast borings, Cincinnati	7.50 to 8.00
Cast borings, Cleveland	9.00 to 9.25
Cast borings, St. Louis	8.00 to 8.50
Cast borings, Chicago	8.00 to 8.50
Cast, No. 1, Chicago	15.50 to 16.00
Cast, No. 1, Cincinnati	15.50 to 16.00
Cast, No. 1, Cleveland	17.00 to 17.50
Cast, No. 1, St. Louis	15.00 to 15.50

Freight Rates, Finished Material

From Pittsburgh, carloads, per 100 lbs. to:—

New York	16.9 cents
Philadelphia	15.9 cents
Boston	18.9 cents
Buffalo	11.6 cents
Baltimore	15.4 cents
Cleveland	10.5 cents
Cincinnati	15.8 cents
Chicago	18.9 cents
Detroit	15.7 cents
Minneapolis and St. Paul	32.9 cents
Denver	83.6 cents
St. Louis	23.6 cents
New Orleans	30 cents
Birmingham	45 cents
Pacific coast (all rail)	73.9 cents
Pacific coast (tin plate)	70 cents
Pacific coast, via Panama canal	61.9 cents

Cut forge, Chicago	23.00 to 23.50
Grate bars, Cleveland	12.00 to 12.50
Iron axles, St. Louis	36.50 to 37.00
Iron axles, Cleveland	44.00 to 45.00
Knuckles, coup., Chicago	23.00 to 23.50
Knuckles, coup., St. Louis	23.00 to 23.50
Locomotive tires, Chicago	31.00 to 31.50
Locomotive tires, St. Louis	31.00 to 31.50
Machine shop turnings, Chicago.	9.00 to 9.50
Machine shop turnings, Cleveland	8.75 to 9.00
Machine shop turn'gs, Cincinnati	7.00 to 7.50
Machine shop turn'gs, St. Louis	9.00 to 9.50
Malleable agricultural, Chicago	15.00 to 15.50
Malleable agricultural, St. Louis	15.50 to 16.00
Malleable, Cincinnati	12.50 to 13.00
Malleable railroad, Chicago	17.25 to 17.75
Malleable railroad, St. Louis	16.00 to 16.50
Pipes and flues, Cleveland	15.00 to 15.75
Pipes and flues, Chicago	14.00 to 14.50
Pipes and flues, St. Louis	14.00 to 14.50
Railroad wrought, No. 1, Cleve.	25.00 to 25.50
Railroad wrought, No. 1, Chgo.	24.00 to 24.50
Railroad wrought, No. 1, Cinci.	19.00 to 20.00
Railroad wrought, No. 1, St. L.	23.50 to 24.00
Railroad wrought, No. 2, Chgo.	23.00 to 23.50
Railroad wrought, No. 2, St. L.	22.50 to 23.00
Shafting, St. Louis	24.50 to 25.00
Springs, Chicago	24.00 to 24.50
Steel car axles, St. Louis	35.00 to 35.50
Steel car axles, Chgo.	35.00 to 36.00
Stove plate, Chicago	11.50 to 12.00
Stove plate, Cleveland	12.25 to 12.75
Stove plate, Cincinnati	10.50 to 11.00
Stove plate, St. Louis	11.50 to 12.00

(Gross Tons.)

Axle turnings, Cleveland	$16.50 to 16.75
Axle turnings, Buffalo	17.50 to 18.00
Busheling, No. 1, Buffalo	20.50 to 21.50
Busheling, No. 1, Pittsburgh	16.50 to 17.25
Busheling, No. 2, Buffalo	13.00 to 13.50
Bundled sheets, Pittsburgh	16.00 to 16.50
Bundled sheets, Cleveland	14.50 to 15.00
Bundled sheets, Buffalo	14.00 to 14.50
Bundled tin, Buffalo	13.50 to 14.00
Car wheels, (iron), Pittsburgh	21.00 to 22.00
Car wheels, (steel), Pittsburgh	27.00 to 28.00
Car wheels, Chicago	18.25 to 18.75
Car wheels, eastern Pa	20.50 to 21.00
Car wheels, Buffalo	23.00 to 23.50
Car wheels, New York	19.00 to 20.00
Car wheels, St. Louis	18.50 to 19.00
Car wheels, Birmingham	17.50 to 18.50
Car wheels, Cleveland	18.50 to 19.00
Tram car wheels, Birmingham	15.50 to 16.50
Cast borings, New York	10.50 to 11.00
Cast borings, eastern Pa	13.00 to 13.50
Cast borings, Buffalo	11.00 to 11.50
Cast borings, Pittsburgh	12.00 to 12.50
Cast, No. 1, eastern Pa	19.50 to 20.50
Cast, No. 1, Pittsburgh	20.00 to 21.00
Cast, No. 1, Birmingham	17.00 to 18.00
Cast, heavy, No. 1, N. J. points	20.00 to 20.50
Forge, No. 1, eastern Pa	14.75 to 15.25
Frogs, switches, guards, St. L.	20.50 to 21.00
Grate bars, Buffalo	15.00 to 15.50
Grate bars, N. J. points	13.50 to 14.00
Heavy axle turnings, Buffalo	16.00 to 16.50
Heavy melting steel, Pittsburgh	22.00 to 23.00
Heavy melting steel, Buffalo	25.50 to 26.50
Heavy melting steel, Chgo.	21.50 to 22.00
Heavy melting steel, Cleveland	21.50 to 22.00
Heavy melting steel, Cincinnati	19.00 to 20.00
Heavy melting steel, eastern Pa.	20.00 to 20.50
Heavy melting steel, New York	17.50 to 18.00
Heavy melting steel, St. L.	20.50 to 21.00
Heavy melting steel, Birmingham	17.50 to 18.50
Hydraulic pressed sheet, Clevel'd	17.50 to 18.00
Hydraulic pressed sheets, Pbgh.	18.00 to 18.50
Hydraulic pressed sheets, Chgo.	14.50 to 15.00
Iron rails, Chicago	27.50 to 28.00
Iron rails, Buffalo	25.00 to 26.00
Iron rails, Cincinnati	24.00 to 25.00
Iron rails, St. Louis	26.50 to 27.00
Iron rails, Cleveland	29.00
Iron axles, Pittsburgh	39.00 to 40.00
Iron axles, Cincinnati	40.00 to 41.00
Iron axles, eastern Pa	38.00 to 40.00
Iron axles, Chicago	38.00 to 39.00
Iron axles, Buffalo	45.00
Low phos. steel, Buffalo	32.00 to 36.00
Low phos. steel, Pittsburgh	30.00 to 32.00
Low phos. steel, eastern Pa	30.00 to 32.00
Machine shop turnings, Buffalo	11.00 to 11.50
Mch. shop turnings, New York	10.00 to 10.50
Mch. shop turnings, Pittsburgh	11.75 to 12.25
Mch. shop turnings, eastern Pa	12.50 to 13.00
Mch. shop turnings, Birmingham	9.00 to 10.00
Malleable railroad, Cleveland	20.50 to 21.00
Malleable railroad, Buffalo	22.00 to 23.00
Malleable railroad, Pittsburgh	21.00 to 21.25
Malleable railroad, eastern Pa	16.50 to 17.00
R. R. and mch. cast, No. 1, Bfl.	22.50 to 23.00
R. R. wrought, No. 1, Buffalo	30.00 to 31.00
R. R. wrgt., No. 1, eastern Pa.	26.00 to 27.00
City wrought, New York	21.25 to 21.50
R. R. wrought, No. 1, Pbgh.	24.00 to 24.50
R. R. wrought, No. 1, B'ham	18.00 to 19.00
Reroll. rails, 5 ft. & ov., Pbgh.	29.00 to 30.00
Reroll. rails, 5 ft. & ov., Chgo.	26.00 to 26.50
Reroll. rails, 5 ft. & ov., E. Pa.	27.00 to 28.00
Reroll. rails, 5 ft. & ov., St. L.	25.00 to 25.50
Shafting, New York	24.00 to 25.00
Shafting, eastern Pa	27.00 to 28.00
Shoveling steel, Chgo	18.25 to 18.75
Shoveling steel, St. Louis	17.50 to 18.00
Steel rails, short, Chicago	23.50 to 24.00
Steel rails, short, Cleveland	23.50 to 24.00
Steel rails, over 6 ft., Cleveland	21.00 to 22.00
Steel rails, old, Birmingham	20.00 to 21.00
Steel rails, short, St. Louis	24.00 to 24.50
Steel car axles, Birmingham	34.00 to 35.00
Steel car axles, New York	38.00 to 40.00
Steel car axles, Buffalo	45.00
Steel car axles, Cleveland	49.00 to 50.00
Steel car axles, Pittsburgh	39.00 to 40.00
Steel car axles, eastern Pa	41.00 to 43.00
Stove plate, N. J. points	14.00 to 14.50
Stove plate, Birmingham	11.00 to 12.00
Stove plate, Buffalo	14.00 to 14.50
Stove plate, eastern Pa	16.00 to 17.00
Stove plate, Pittsburgh	13.00 to 14.00
Wrought pipe, Buffalo	16.00 to 16.50
Wrought pipe, eastern Pa	16.75 to 17.25
Wrought pipe, New York	14.50 to 15.00

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ALUMINUM ALLOYS.

United Smelt'g & Alum. Co., New Haven, Ct.

ALUMINUM INGOTS.

United Smelt'g & Alum. Co., New Haven, Ct.

ALUMINUM RODS (Sheet).

United Smelt'g & Alum. Co., New Haven, Ct.

ANGLES, TEES, CHANNELS (See Steel, Structural).

ANNEALING BOXES AND POTS.

Blackwood Steel Fdy. Co., The, Springfield, O.
Knox Pressed & Welded Steel Co., Pittsburgh.
Mesta Machine Co., Pittsburgh, Pa.
Pittsburgh Annealing Box Co., Pittsburgh, Pa.
Pittsburgh Malleable Iron Co., Pittsburgh, Pa.
Pittsburgh Valve Foundry & Const. Co., Pittsburgh, Pa.
Swedish Crucible Steel Co., Detroit, Mich.
United Engrg. & Foundry Co., Pittsburgh, Pa.
Zanesville Malleable Iron Co., Zanesville, O.

ANTI-SLIP TREADS FOR STAIRS.

Pittsburgh Iron & Steel Foundries Co., Pittsburgh, Pa.

ARCHITECTURAL SHAPES.

Empire Art Metal Co., College Pt., N. Y.

ARMATURES.

General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

ASH BUCKETS.

Lakewood Engrg. Co., Cleveland, O.

AUTO TOWING CABLES.

American Steel & Wire Co., Chicago, Ill.

AUTO TRUCKS.

Federal Motor Truck Co., Detroit, Mich.

AXLES.

American Bridge Co., New York City.
American Steel Export Co., New York City.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Cambria Steel Co., Philadelphia, Pa.
Camden Forge Co., Camden, N. J.
Carnegie Steel Co., Pittsburgh, Pa.
Illinois Steel Co., Chicago, Ill.
Lockhart Iron & Steel Co., Pittsburgh, Pa.
National Tube Co., Pittsburgh, Pa.
Otis Steel Co., Cleveland, O.

BABBITT METAL.

Keystone Bronze Co., Pittsburgh, Pa.
Lubricating Metal Co., The, New York City.
Ryerson, Jos. T., & Son, Chicago, Ill.

BAKERS, WIRE COATING.

Morgan Construction Co., Worcester, Mass.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

BALE TIES.

American Steel & Wire Co., Chicago, Ill.

BALLS (Steel).

Bethlehem Steel Co., The, So. Bethlehem, Pa.
New Departure Mfg. Co., Bristol, Conn.

BANDERS (Hydraulic for Projectiles).

Southwark Foundry & Mach. Co., Philadelphia.
West Tire Setter Co., The, Rochester, N. Y.

BANDS (Steel).

Akron-Selle Co., The, Akron, O.
Carnegie Steel Co., Pittsburgh, Pa.

BARGES (Steel).

American Bridge Co., New York City.

BARRELS, TUMBLING (Wire Nails).

Turner, Vaughn & Taylor Co., Cuyahoga Falls, O.

BARROWS (Foundry).

Biehl Iron Works, Inc., The, Reading, Pa.

BARS (Concrete Reinforcing).

Bourne-Fuller Co., Cleveland, O.
Carnegie Steel Co., Pittsburgh, Pa.
Cincinnati Iron & Steel Co., Cincinnati, O.
Franklin Steel Works, Franklin, Pa.
Inland Steel Co., Chicago, Ill.
Laclede Steel Co., St. Louis, Mo.
Ryerson, Jos. T., & Son, Chicago, Ill.
Trussed Concrete Steel Co., Detroit, Mich.
Upson Nut Co., Cleveland, O.
Witherow Steel Co., Pittsburgh, Pa.

BARS (Iron and Steel).

American Bridge Co., New York, N. Y.
American Iron & Steel Mfg. Co., Lebanon, Pa.
American Steel Export Co., New York City.
Belmont Iron Works, Philadelphia, Pa.
Bethlehem Steel Co., The, So. Bethlehem, Pa.
Bingham, W., Co., The, Cleveland, O.
Bourne-Fuller Co., Cleveland, O.
Brown-Wales Co., Boston, Mass.
Cambria Steel Co., Philadelphia, Pa.
Camden Forge Company, Camden, N. J.
Carnegie Steel Co., Pittsburgh, Pa.
Cincinnati Iron & Steel Co., Cincinnati, O.
Franklin Steel Works, Franklin, Pa.
Harvey, Arthur C., Co., Boston, Mass.
Illinois Steel Co., Chicago, Ill.
Illinois Steel Co., Warehouse Dept., Chicago.
Illinois Steel Warehouse Co., St. Louis, Mo.
Illinois Steel Warehouse Co., St. Paul, Minn.
Inland Steel Co., Chicago, Ill.
Jones & Laughlin Steel Co., Pittsburgh, Pa.
Lackawanna Steel Co., Buffalo, N. Y.
Lockhart Iron & Steel Co., Pittsburgh, Pa.
Milton Mfg. Co., Milton, Pa.
Republic Iron & Steel Co., Youngstown, O.
Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.
Standard Gauge Steel Co., Beaver Falls, Pa.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
Trussed Concrete Steel Co., Detroit, Mich.
United Alloys Steel Corp., The, Canton, O.
Upson Nut Co., Cleveland, O.
Westerman & Co., Lockport, N. Y.

BEAMS, CHANNELS AND ANGLES.

American Steel Export Co., New York City.
Belmont Iron Works, Philadelphia, Pa.
Bourne-Fuller Co., Cleveland, O.
Carnegie Steel Co., Pittsburgh, Pa.
Empire Art Metal Co., College Pt., N. Y.
Franklin Steel Works, Franklin, Pa.
Illinois Steel Co., Chicago, Ill.
Ryerson, Joseph T., & Son, Chicago, Ill.
Scully Steel & Iron Co., Chicago, Ill.

BEARINGS (Ball).

New Departure Mfg. Co., Bristol, Conn.

BEARINGS (Vanadium Steel).

American Vanadium Co., The, Pittsburgh, Pa.

BELT CEMENT AND DRESSING.

Graton & Knight Mfg. Co., Worcester, Mass.
Texas Company, The, New York City.

BELT LACING (Leather).

Chicago Rawhide Mfg. Co., Chicago, Ill.
Graton & Knight Mfg. Co., Worcester, Mass.

BELTING (Chain).

Link-Belt Company, Chicago, Ill.

BELTING (Leather).

Bingham, W., Co., The, Cleveland, O.
Chicago Rawhide Mfg. Co., Chicago, Ill.
Graton & Knight Mfg. Co., Worcester, Mass.

BENCHES (Steel).

New Britain Mach. Co., New Britain, Conn.

BENCHES AND FRAMES (Drawing).

Morgan Construction Co., Worcester, Mass.
Turner, Vaughn & Taylor Co., The, Cuyahoga Falls, O.

BENDING AND STRAIGHTENING MACHINES.

Abramsen Engrg. Co., Pittsburgh, Pa.
Bertsch & Co., Cambridge City, Ind.
Birdsboro St'l Fdy. & Mch. Co., Birdsboro, Pa.
Cleveland Punch & Shear Works Co., Cleveland, O.
Espen-Lucas Machine Works, Philadelphia, Pa.
Hinman, D. A., & Co., Sandwich, Ill.
Lourie Mfg. Co., Springfield, Ill.
Mackintosh, Hemphill & Co., Pittsburgh, Pa.
Niles-Bement-Pond Co., New York, N. Y.
United Engrg. & Fdy. Co., Pittsburgh, Pa.

BENZOL RECOVERY PLANTS.

Koppers, H., Co., Pittsburgh, Pa.

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